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November 19, 2008

New York State Department of Health
Flanigan Square
547 River Street, Room 400
Troy, New York 12180

VIA FEDERAL EXPRESS

Attention: William M. Gilday, P.E.

Reference: Village of Wappingers Falls
Water Supply – Source Improvements
DWSRF IUP #15288, PWS #1302783
Dutchess County

Dear Mr. Gilday:

Enclosed please find three (3) copies of the Engineer's Design Estimate and Planning Report, dated November 19, 2008, for the proposed Village of Wappingers Falls Source/Supply Improvements. This report is a revised version of the Engineer's Design Estimate prepared and submitted on August 10, 2007. This report provides an estimate of the facility improvements and their associated costs, with documents supporting the need for the proposed facilities.

As you know, the Village has been exploring in depth all items to develop its existing well field to meet their current and future water supply source needs. In the meantime, the Village continues to purchase water from the Poughkeepsie joint Water Board under a five year, short-term, water contract until well field improvements can be constructed and put in service. This contract expires at the end of 2012.

The enclosed documents describe the proposed improvements at the Village well field as well as the financial considerations behind the Village plan. A comparison of the long-term costs of the well field construction under various financing options is included.

The Village has decided to pursue financing through the DWSRF Guarantee program and desires to submit their application with a preliminary design report in March, 2009. We believe the components necessary to build a state of the art water production facility are outlined in the enclosed report, however, it is recognized that the NYSDOH has ultimate design approval authority. The Village is looking for input from your office before proceeding with more detailed design to ensure that the resulting plans can meet all current and future DOH and EPA regulations.

Should you have any questions or require additional information regarding this matter, please do not hesitate to contact this office.

Very truly yours,

Joseph E. Stankavage

Joseph E. Stankavage
Design Engineer

JES:js
Enclosure
cc: Hon. Matthew Alexander, Mayor
Rob Alfonso, Water Board Chairman
Hon. John Karge, Village Clerk
Jennifer Brown, Village Treasurer
Greg Supple, Esq., Lyons & Supple
James Horan, Esq., Vergilis, Stenger, Roberts & Partners
Victor Cornelius, Endeavor, Inc.
J. Theodore Fink, AICP, Greenplan, Inc.
Ray Hart, Public Finance Associates

ENGINEER'S DESIGN ESTIMATE
AND
PLANNING REPORT

VILLAGE OF WAPPINGERS FALLS SOURCE/SUPPLY IMPROVEMENTS
PUBLIC WATER SOURCE STABILIZATION
VILLAGE OF WAPPINGERS FALLS
DUTCHESS COUNTY
PWS #1302783/DWSRF IUP #15288

PREPARED FOR

NEW YORK STATE DEPARTMENT OF HEALTH
NEW YORK STATE ENVIRONMENTAL FACILITIES CORPORATION
FLANIGAN SQUARE
TROY, NEW YORK 12180

November 19TH, 2008

PREPARED BY:

PAGGI, MARTIN & DEL BENE, LLP
CONSULTING ENGINEERS & LAND SURVEYORS
56 MAIN STREET
POUGHKEEPSIE, NEW YORK 12601

TABLE OF CONTENTS

1.0 **INTRODUCTION**:

This report outlines the facility improvements required to the Village of Wappingers Falls Water Source and Supply in order to bring it into compliance with current and expected future Federal, New York State and Dutchess County regulations governing Public Water Supplies. These regulations include Part 5 of the New York State Sanitary Code, the GLUMRB "Ten States" Standards for Water, and the pending EPA regulations for groundwater source treatment and disinfection. We have calculated that the full build out maximum day water flow for the Village is 1,000,000 gallons per day (700± GPM). The average day Village use is estimated as 650,000± GPD at full build out. This estimate of new facilities and associated costs is based on converting and adding to existing site facilities to create a water source and supply capable of producing 1 MGD±.

The original version of this report was submitted to the New York State Health Department in August of 2007. This report has been revised to reflect changes in the design of the proposed facilities and a phased approach to design and construction.

Background:

Since 1997 the Village has had an emergency interconnection with the Town of Poughkeepsie Water system. This emergency connection had allowed the Village to purchase approximately half of their supply needs from the Poughkeepsie Joint Water Board. As time has passed, and some of the Village supply wells were removed from service due to high iron content in the water, the Village became reliant upon this "Emergency Connection" as a primary source of water. The Village Water Board and the Poughkeepsie Joint Water Board (PJWB) have had a series of short term, five-year contracts for water, the last of which was recently ratified, effective January 1, 2008.

In October 2006, the Poughkeepsie water plant began using chloramine as their secondary residual disinfectant. At that point, the Village began purchasing all their water from the PJWB through the emergency connection.

There are two reasons for the Village's current complete dependence on the emergency connection:

1. The Village well field, in its current state, cannot produce and/or treat enough water to meet their maximum daily demand.

2. The Village well field does not have the facilities and equipment necessary to disinfect any water produced at the well field with chloramine. The existing disinfection facility uses chlorine solution for disinfection without any contact time. Water disinfected with chlorine and water disinfected with chloramine cannot be mixed without disrupting the balance of chloramine and producing problems in the distribution system.

The Village has been unable to use their well field as a source because the existing facilities cannot produce the average or maximum daily usage requirement. The Village currently must supplement their well field source with water from Poughkeepsie to currently meet their usage requirements. At minimum, the Village would need to construct a chloramine disinfection plant to replace their existing chlorine disinfection process so that any water produced from the Village well field could be mixed with water purchased from the Poughkeepsie Joint Water Board.

Over the past two years, the Village Water Board has been considering their source and supply water options. Attempts to negotiate a long-term contract for water purchased from the Poughkeepsie Joint Water Board were unsuccessful, prompting the Village Water Board to reconsider upgrades to their well field. A short-term, five year contract with the Poughkeepsie Joint Water Board was successfully negotiated and signed, effective January 2008. This allows the Village time to plan and construct improvements at the well field as necessary to upgrade and expand capacity. The goal of the Village Water Board through this project is to create an adequate, stable, and dependable water source to serve the Village now and for the foreseeable future.

2.0 **EXISTING CONDITIONS**:

The Village of Wappingers Falls well field is located on an 8.0 acre parcel of land situated to the east of the New York State Route 9D (West Main Street) along the northerly banks of Wappinger Lake. Past analytic testing of possible organic and/or inorganic contaminants has shown the water to be suitable quality for drinking water purposes.

- Well #3 is a 12" x 18" gravel pack type well, 95 feet in depth, originally constructed in 1959 and re-drilled in 1997. Prior to October 2006, Well No. 3 was the primary production well. In 2005, a hydrogeologic analysis and pumping tests at the well field indicated that this well could sustainably produce 152 gallons of water per minute in combination with well numbers 4 and 7 and 164 gpm in combination with Well No. 7 only.

- Well #4 is a 12" x 18" gravel pack type well 100 feet in depth, originally constructed in 1965 and re-drilled in 1997. Well No. 4 was taken offline in October of 2003 due to an increase in iron content. In 2005, a hydrogeologic analysis and pumping tests at the well field indicated that this well could sustainably produce 375 gallons of water per minute in combination with well numbers 3 and 7.

- Well #5 is a 24" x 30" gravel pack type well, 105 feet in depth, originally constructed in 1984. Well #5 was taken off line in 1994 due to significant increases in iron content.

- Well #1 and #2 have permanently been out of service.

- Well #7 is a 16" x 24" gravel pack type well, 99 feet in depth, drilled in 2005. Well #7 has not been completed or connected to the Village water system, although plans approved by the New York State Department of Health exist to perform this work. In 2005, a hydrogeologic analysis and pumping tests at the well field indicated that this well could sustainably produce 504 gallons of water per minute in combination with well numbers 3 and 4 and 556 gpm in combination with Well No. 3 only.

Sustainable Yield for Different Pumping Scenarios*

Wells	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Active Wells	Pumping Rate (gpm)	Active Wells	Pumping Rate (gpm)	Active Wells	Pumping Rate (gpm)	Active Wells	Pumping Rate (gpm)
Well 3	X	152	X	194	X	164		
Well 4	X	375	X	390			X	390
Well 7	X	504			X	556	X	600
Total	**3**	**1,031**	**2**	**584**	**2**	**720**	**2**	**990**

*From Well 7 Completion Report prepared by Leggette, Brashears & Graham Inc., Dated October 2006.

- An interconnection with the Town of Poughkeepsie Water System was installed during the latter months of 1996, and was put into operation on February 5, 1997. The interconnection was made on DeLavergne Avenue in the vicinity of the Village of Wappinger Falls Water Storage Tank, and was equipped with a subsurface concrete vault housing metering, backflow prevention, and pressure reducing equipment. This interconnection allows the Village of Wappingers Falls system to draw water from the more historically reliable Joint City/Town of Poughkeepsie surface water source (Hudson River) during times of decreased well field production and/or emergency conditions. Since October 2006, when the Poughkeepsie Water Plant switched to chloramine disinfection, the Village has purchased its entire water supply from the Poughkeepsie Joint Water Board through this emergency interconnection.

The Village of Wappingers Falls water storage facilities consist of three (3) tanks.

- The Wenliss Tank has a capacity of 1.4 million gallons.
- The DeLavergne Tank has a capacity of 545,000 gallons.
- The Hillside Tank has a capacity of 170,000 gallons. (Currently not in use)

The following treatment processes are utilized at the Village of Wappingers Falls Municipal Water System:

- Well No. 5 exhibited naturally occurring elevated levels of iron and manganese. Manganese removal was accomplished by means of an intermittently regenerated manganese greensand filtration system.

- The groundwater sources also exhibit naturally occurring elevated hardness levels. The water is softened utilizing an ion exchange system that removes the hardness producing ions (calcium and magnesium). The existing softener plant has a capacity of 500 GPM.

- Prior to entry into the distribution system, the water facilities exist to disinfect with a sodium hypochlorite solution. The existing chlorination equipment is capable of disinfecting up to 500 GPM. However, there are no detention facilities at the site capable of providing the necessary chlorine contact time in accordance with state and federal regulations.

- Water supplied from the Town of Poughkeepsie Treatment Facility utilizes the conventional filtration process. Chloramine is added to water at the plant to maintain a "residual" level of disinfectant throughout the distribution system.

All existing Village wells, the softener plant, the manganese filtration system, and the chlorine disinfection facilities are currently inactive. Because chloramine disinfection processes are incompatible, the Village well field production wells and treatment facilities have been shut-in and shutdown. The sole source of water to the Village at this time is the emergency interconnection with the Town of Poughkeepsie. The Village will continue to be dependent on the emergency interconnection until the first phase of improvements at the well field described herein are completed.

3.0 **PROPOSED IMPROVEMENTS**:

This project proposes to upgrade the Village source and supply so that is it able to produce and treat up to one million gallons of water per day in accordance and compliance with all current, Federal, State and County regulations for public water supply. The new facilities will be constructed in phases with new structures and equipment having the capacity to support future phases of construction and expected changes to water treatment requirements. Table 1 lists the major tasks that we believe should be part of this comprehensive upgrade of the Village source and supply.

The first task is the completion and connection of Well #7 to the existing system. Approved plans exist for this work and the work can be immediately put out to bid, following minor modifications needed to accommodate Well #7A, upon the approval of this overall improvement plan.

In 2003, the Village hired Leggette, Brashears and Graham (LBG) to perform a hydrogeologic study of the Village well field and underlying aquifer. This study identified potential locations for a new water supply well and confirmed that the aquifer is capable of providing the peak flow required to supply the Village. In 2005, the Village drilled Well #7 at a location identified in the LBG report to supplement the production of Well #3. The construction of Well #7 was initially financed through a Bond Anticipation Note. It is the intent of the Village to include the cost of the LBG study, and drilling and testing Well #7 in their application for DWSRF financing since these items were integral parts of the overall well field improvement project.

A sister well to number 7, (to be named number 7A) will be drilled and completed. The new well 7A will be approximately 30 feet southwest of well number 7 and is expected to be able to provide an equivalent amount of water. This well will only be pumped when well #7 is off. It is expected that well #7 and well #7A will be interchangeable.

The redundancy will allow the Village to meet their maximum daily demand usage with the largest well out of service in accordance with Ten States and Dutchess County Department of Health requirements. Whenever Well #7, the best well, is out of service then Well #7A will be able to make up the lost production. During normal operation, the Village will alternate between these two wells on a regular schedule to insure that they are both in good operating condition. These two wells will never be pumping at the same time. The wells will be powered and controlled at a new motor control center in the existing pump house building. New conduit for power and control wiring will be run to both wells. Both wells will have their own electrical disconnect switch to facilitate repair and maintenance. New piping will be installed from the wells to connect them to the existing collector main near Well #3. Individual meters will be installed at both well heads along with the necessary valves and piping to control the wells.

The next step is to renovate the existing pump house and softener buildings. Rear and side walls will be removed from both existing structures and they will be interconnected with a new building. The existing building façades will be retained. It is hoped to be able to reuse bricks from the removed walls in the façade of the new building section to maintain continuity between the new and existing structures. The back of the new buildings will be rebuilt using new materials with an appropriate finish. The existing roof lines of the individual buildings will be connected to cover across the new building space.

The rear of the pump house building will be renovated to provide storage for equipment and spare materials. The building will house the new motor control center. All controls to operate the pumps will be housed in the new motor control center. A separate programmable logic control system will be installed in the water operator's office in the existing pump house portion of the building. This system will allow control, monitoring, and emergency shut-off of the pumps and major plant components from the building. Through tele-metering, the system will also monitor the storage tanks in the distribution system.

The PLC system will automate normal operation of the water system and could automatically shut down the water plant and wells in an emergency situation. These tasks have been done by hand in the past. Telemetry at the storage tanks in the distribution system will be directly linked to the well field and will be able to automatically start and stop water production based on distribution system need and levels in the storage facilities. At the well field, new control and signal wiring will be installed between the PLC, the wells, and all components of the water plant. All of the automated systems will have built in manual override capacity to allow the Water System Operators to manually operate all system components if needed. The installation and connection of electronic controls and telemetering sensors throughout the well field and to the existing water storage tanks will provide a certain level of automation to the water system and should allow for more efficient operation and control of the system.

The wells will need to pump water to the distribution system as they did in the past. The pumps in Well #7 and #7A will be designed to pump water through the plant components (softeners, disinfection equipment, etc.) and against the maximum pressure within the storage and distribution system. The existing pump at Well #3 will be evaluated and replaced with a new pump or re-powered as needed.

The new plant will also include a restroom, test bench and storage for repair parts for the softeners and disinfection systems. The new building and existing facilities will be upgraded to meet ADA compliance. New water softeners will be installed in the area of the existing softener building. The existing softener has a capacity of up to 500 gpm. The new softeners capacity will be up to 700+ gpm. This improvement will replace the existing softener and brine tank with new equipment to increase treatment capacity to 150% of the existing facility. A new ultraviolet disinfection system along with chlorination equipment will be installed within the building. The ultraviolet disinfection system will be used for primary disinfection. The existing process flow will be changed to accommodate installation of the Ultraviolet disinfection system equipment as the primary disinfection method.

As part of this work, the chlorine disinfection equipment will be modified and expanded to provide residual disinfection of the 700+ gpm of water as it enters the distribution system.. The chlorine solution day tank and chlorinator pumps will be upsized as needed from their current capacity of 500± gpm. The changes to the building and process equipment are the largest part of the proposed improvements.

The proposed building will have space for two (2) trains of ultraviolet disinfection reactors in order to provide 100% redundant primary disinfection. The proposed restroom and lab sink will discharge to existing public sanitary sewer mains on West Main Street. Process piping within and around the existing and proposed buildings will be changed and replaced. Heating, ventilation, dehumidification and electrical systems will be installed and/or replaced with new components. Safety equipment, such as an eyewash, will be installed. The building will be configured so that the chlorination equipment is isolated from the rest of the interior space.

As part of, and in addition to, the above described wells and building, new piping will be installed between the existing and proposed facilities. A piping schematic is enclosed with this report as Figure A. New pipe will connect the wells to the plant. Within the plant, new pipe will connect the water softener, ultraviolet disinfection, greensand filter and the chlorination equipment.

One off-site improvement will be made to the distribution system. As noted, it is intended to use chlorine as the residual disinfectant in the distribution system. At the well field, the existing chlorine injection equipment will be modified to provide a minimal dose of chlorine to the finished water as it leaves the plant and enters the distribution system. In the past, large doses of chlorine were injected at the plant to provide a measurable residual at the distant ends of the distribution system. This practice resulted in some complaints from users near the start of the distribution system. Therefore, a remote chlorine injection site will be constructed near the center of the Village.

This remote injection point will add a small amount of chlorine to the distribution system as needed to maintain the required residual at the most distant points in the distribution system. The existence of two points of chlorine injection should allow more efficient disinfection through the distribution system using lower chemical doses. The lower chlorine dose in combination with primary disinfection by ultraviolet radiation will meet state and local regulations.

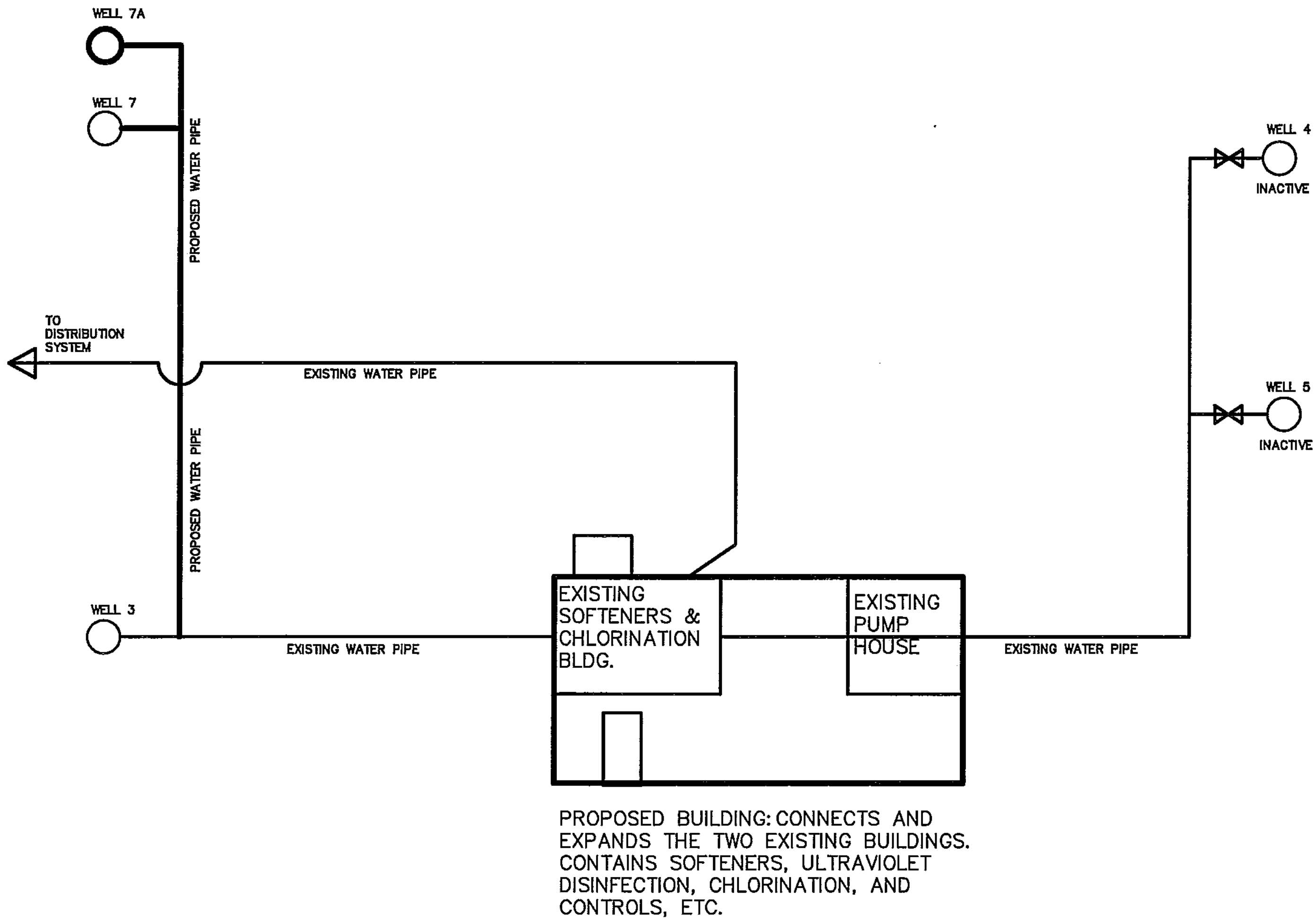
Stub pipes will be left to allow future installation of a modular filtration system. These filters will be required **if** the Village wells are determined to produce Ground Water Under the Direct Influence of surface water (GWUDI). It is recognized that Well No. 4 may be classified as GWUDI under the new EPA Groundwater rules when a final determination is completed. For the time being, Well No. 4 will remain inactive. Well No. 4 will not be used until appropriate filtration is installed to both remove the high concentrations of iron from the well water and address GWUDI concerns.

In coordination with this work, an emergency power generator will be installed at the site. The generator will be sized to power all well field facilities in the event of an outage. An automatic transfer switch will be installed with the generator. A new underground electric service from the street to the proposed plant facilities will be constructed to replace the existing overhead feed. Installing all electrical wiring underground should increase the reliability and security of the power feeding the site.

Security enhancements at the site overall and at all well field facilities is proposed as part of the project. New security lighting will be installed around the building and at the new wells. The new building will be wired with an alarm system that can directly contact local police and water department employees when tripped. New perimeter fence will be installed where needed to prevent unauthorized access to the well field. Existing fences around the individual wells and plant will remain and be repaired as needed. New fence will be installed around the two new wells.

Access to the well field will be limited to a main gate in the fence across the driveway on West Main Street. The new perimeter fence will enclose all property within 200 feet of the new well heads. Vehicle access and parking within the fenced areas will be limited to water department employees, department owned vehicles, and department suppliers and contractors for scheduled deliveries or work at the site. Other site security enhancements will be installed based on the previous site vulnerability assessments.

The final piece of this project is the upgrade of all Village water meters in the distribution system. The water department hopes to replace all existing meters with automatic meter reading ("Radio-Read") technology. This will allow remote data collection from all meters for more efficient meter reading and billing purposes. This will also require that many old meters within the distribution system be replaced. It is hoped that this will help reduce 'lost' water by replacing some old, inaccurate meters. More efficient, accurate, and regular meter readings should also help identify leaks and related problems more quickly which will in turn speed repair activities.



PAGGI, MARTIN, & DEL BENE, LLP.
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PROCESS DIAGRAM FOR

VILLAGE WELL FIELD SOURCE AND SUPPLY IMPROVEMENTS

VILLAGE OF WAPPINGERS FALLS

DUTCHESS COUNTY NEW YORK

SCALE: NONE 11/ 19 /2008

A

SHEET __ OF __

4.0 ESTIMATED COSTS:

The estimated construction cost for these proposed capital improvements to the well field are outlined in Table 1. The total construction cost is estimated at $3,100,000, in 2008 dollars. Total construction costs were escalated at 3% per year to obtain an estimate of $3,288,790 in 2010 dollars as shown in Table 1.

Soft costs associated with construction, such as engineering design, legal, and site inspection, are estimated as follows in 2010 dollars:

• Engineering Design (Civil, Mech, Elec):	$ 328,879
• Construction Inspection:	$ 201,571
• Construction Project Administration:	$ 127,308
• Permitting & Regulatory Approval:	$ 47,741
• Legal - General:	$ 63,654
• Legal – Bond Counsel:	$ 63,654
• Finance Consulting & Administration:	$ 31,827
• Loan Application Fees & Administration:	$ 106,900
• Loan & Project Administration (Municipal Force Account work):	$ 53,045
• State Environmental Quality Review	$ 26,523
	$ 1,023,769

The estimated cost of the total improvements, including soft costs in 2010 dollars is $4,312,559.

The Village is also looking to recover previous expenditures related to the well field upgrade and expansion. In 2003, the Village hired Leggette, Brashears and Graham to perform a hydrogeologic study of the well field. The cost for the study was $204,000. In 2005 the Village drilled and tested Well No. 7. The cost to drill and test the well came to $235,379.51. In total, the Village is looking to recapture actual expenses of $439,380 for these two projects.

The total project amount to be financed through the DWSRF loan program is estimated as $4,751,938. Direct and Bond Issuance costs to EFC should be added to this total. These costs are estimated as 1.7% of the total bond amount or $80,783.00 for a grand total of $4,832,721.

5.0 **DEBT REPAYMENT**:

It is anticipated that this project will be funded via participation in the Drinking Water State Revolving Fund (DWSRF) administered by the New York State Department of Health and the New York State Environmental Facilities Corporation (EFC). The DWSRF provides subsidized financing for water supply projects that provide the public with safe drinking water, bring facilities into compliance with Federal, State or Local Health Standards, or prevent future violations of standards. The DWSRF provides subsidized, low interest rate, pooled loans for construction of eligible water system projects. The DWSRF also provides a financing guarantee program which allows qualifying projects to be bonded over 30 years using the New York State's bond rating. The guarantee program cost is approximately the same as a conventional loan, however realizing the State's interest rate. The program provides other benefits such as the possibility of qualifying for a subsidized or hardship loan in the future. If certain "hardship" conditions exist in a public water system, it is possible for EFC to provide a direct loan with a zero percent interest rate.

This report analyzes three (3) different financing options in detail: a conventional loan, a typical DWSRF Guaranteed loan, and a USDA loan. The annual repayment finance cost for each of these loans is summarized in Table 2. It was decided that the DWSRF Guarantee loan is the best option for the Village.

It is the understanding of the Village that they may pursue funding through the DWSRF EFC guarantee program and remain on the Intended Use Plan Readiness List. In the future, if the funding line of the DWSRF is lowered such that this project qualifies for a subsidized or hardship loan, then the project will be immediately included in the subsidized or hardship loan program.

Prior to choosing DWSRF as the preferred financing method, the Village analyzed financing the work directly with municipal bonds and applying for USDA grant and loan funding. An assumed debt of approximately $5,000,000 serviced over 30 years was used for the comparison. For USDA and private financing, the total amount financed was $4,916,400 based on an approximate cost for EFC direct and issuance fees that would not be realized under these financing options. The total amount financed under the EFC Guarantee program was $5,000,000. Direct financing was determined to be more expensive. The USDA, though less expensive on initial review, was deemed more expensive than the DWSRF program because of additional administrative costs and the lost opportunity to potentially obtain a DWSRF subsidized or hardship loan. USDA financing is also more dependent on federal funding, leaving the possibility that the Village may qualify for the USDA program but not be able to receive any benefit because of federal budget issues.

The first year annual cost to repay the DWSRF Guarantee Loan is approximately $336,556. This compares to the first year annual cost of $347,900 for a conventional loan, and a first year annual cost of $240,300 for a USDA federal loan. The debt repayment cost would be part of a larger, overall annual cost to operate and maintain the new water production facilities.

6.0 **OPERATION AND MAINTENANCE COSTS**:

The Village Water Department currently employs three operators to repair, manage, and maintain the existing distribution and storage system. The cost of operating and maintaining the distribution system does not necessarily depend on the water source. These costs are assumed to be the same whether or not the Village builds the proposed water plant and therefore, they have been left out of this analysis.

The following costs are those associated with the operation and maintenance of the proposed well field improvements and water plant only:

- ***Manpower*** – Estimate One (1) Additional Operator:

  Annual Cost . . . . $ 70,000

- ***Electrical Power*** – For Well Pumps, Ultraviolet Disinfection, and related Electrical Controls, Lights, Etc.

  Annual Cost . . . . $ 110,000

- ***Chemicals*** – Chlorine Solution, Potassium Softener Salt, UV lamp replacement, Etc.

  Annual Cost . . . . $ 75,000

- ***Sampling*** – Manpower and outside laboratory testing of water.

  Annual Cost . . . . $ 35,000

- ***Well Redevelopment*** – Cost to re-develop one (1) well per year. Individual well redeveloped every third year.

  Annual Cost . . . . $ 30,000

Together, these additional operation and maintenance costs would increase the annual expense of running the water system by $320,000 per year. These costs would be paid by residents in the form of water rates.

7.0 **SUMMARY:**

The proposed improvements described herein will create an adequate, stable and dependable water source and supply for the Village. The proposed plant should provide flexible treatment options no matter what the quality of water produced from the wells in the future. The proposed ultraviolet system will provide adequate primary disinfection and chlorine disinfection will provide a residual disinfection in the distribution system. The expansion of water softening and chlorination capacities will allow the Village to produce and treat enough water to meet their maximum demand. Changes to the pump controls, upgraded meters, and the addition of telemetering will allow more efficient operation of the entire water system. Telemetering and modern electronic controls will allow for quicker reaction to small problems by operators and should enhance overall system security. The proposed onsite backup power generator will insure that residents have access to clean, potable water during general power failures and similar local and/or widespread infrastructure failures.

It can be shown that the cost to purchase water from Poughkeepsie is not a financially responsible or viable option for the Village over the long term due to the PJWB's contract requirement to escalate costs based on the Metro-NY Consumer Price Index. The Village, as a small system with a limited tax base, will not be able to afford the continuously increasing water rate requisite to a long term contract with Poughkeepsie. For the same reason, we believe that the cost of conventional financing for a project of this size will be a hardship for the Village to repay. The Village intends to pursue financing of the project through the DWSRF Guarantee program. It is hoped that the project could in time qualify for either a subsidized or hardship loan, thereby further reducing the cost to Village users. These improvements are clearly needed for the Village to return to producing their own water supply. However, if financial assistance cannot be obtained to bring the cost of the improvements in line with the current cost to purchase water and stabilize that cost over the long-term, it is not likely that this project will proceed. Without this project, Village residents will face larger annual price increases for water because the Village would have to continue to purchase water from Poughkeepsie. As a result of these improvements, the Village will be able to produce an adequate supply of water meeting all Federal, State and Local regulations, independent of any current or future interconnections with other municipalities. The Village will have control over their water supply and will have the "security of supply" that comes with that control.

APPENDIX " A"

TABLES

TABLE 1

Date: November 12, 2008

PROPOSED TASK	ESTIMATED SCOPE OF CONSTRUCTION ACTIVITY	2008 ESTIMATED COST	2010 2008 +3%/Year
1. Drill New Well 7A Next to Well 7 as a Backup.	Well drilling and testing (quality and quantity). LBG	$300,000	$318,270
2. Well 7 & 7A Completion and Connection	Install well pumps and pitless unit at wells. Install piping, meter vault and appurtenances between the well and the existing system. Install pump starter/controls in the existing pump house.	$150,000	$159,135
3. Emergency Power Generator and Electrical Upgrade	MEP- Engine Driven Generator; Electrical Demolition; New electrical services; Re-power existing well #3; Powering Wells 7 & 7A; included in cost. Diesel or natural gas fired power supply capable of powering the proposed water treatment plant and well pumps. New electrical service through site and to proposed wells & facilities.	$275,000	$291,748
4. New Water Softeners including new brine tank and building improvements	Replace existing water softening equipment and plant equipment within the existing softening building. This will include expanding the building, interior piping, brine tank, and associated improvements for the new softening system.	$550,000	$583,495
5. General Improvements to existing buildings for sanitary, safety, security and storage.	MEP - New Bathroom plumbing (hot water, eyewash and Lab Sink); HV and Dehumidification; New Motor Control Center; Miscellaneous Electrical (General Lighting and Power); included in cost. Expand existing buildings to provide new sanitary restroom facility; safety equipment and facilities such as a new eyewash; building expansion for storage and Motor Control Center.	$575,000	$610,018
6. Ultraviolet Disinfection System	Ultraviolet light will be used as the primary disinfection method. 2 trains of ultraviolet disinfection reactors for 100% redundant disinfection capacity.	$500,000	$530,450
7. Water Plant Piping	New 8" and 12" pipe between the wells and the new water plant, and between the water plant and the distribution system and related improvements.	$100,000	$106,090
8. Site Improvements and Security	General site improvement and security enhancements based on site vulnerability assessment. (lights, fences, etc.)	$100,000	$106,090
9. Onsite and Remote Chlorine Injection Point	Improve chlorine storage/disinfection facility on site. Site, design and construct remote facility for chlorine injection including distribution system improvements.	$150,000	$159,135

10. Telemetering/Controls	MEP - Control Wiring included in cost. Electronic sensors and controls at water tanks, well field, remote chlorination point and the new plant. For monitoring water levels, quality and controlling water pumping from wells, through the plant, and out to the distribution system.	$150,000	$159,135
11. Water Meter Upgrade	Upgrade of all water meters in the Village with Radio-read technology for remote data collection.	$250,000	$265,225
TOTAL CONSTRUCTION COST	*(Includes MEP Costs)*	**$3,100,000**	**$3,288,790**
Engineering Design (Civil, Mechanical, Electrical)		$310,000	$328,879
Loan & Project Municipal Administrative (Force Account - 5 years)		$50,000	$53,045
Legal - General		$60,000	$63,654
Legal - Bond Counsel		$60,000	$63,654
Finance - Consultant/Administration		$30,000	$31,827
Permitting & Regulatory Approval		$45,000	$47,741
Construction Project Inspection		$190,000	$201,571
Construction Project Administration & Management		$120,000	$127,308
Loan Application Fees & Administration		$100,000	$106,090
State Environmental Quality Review		$25,000	$26,523
Subtotal - Soft Costs		$990,000	$1,023,769
TOTAL ESTIMATED COST		**$4,090,000**	**$4,312,559**

COMPLETED TASK	ESTIMATED SCOPE OF CONSTRUCTION ACTIVITY	ACTUAL COST	
12. Hydrogeologic Study of the well field	Identify and analyze aquifer characteristics. Identify potential sites for a new production well.	$204,000	$204,000
13. Drill & Test Well No. 7	Well Drilling and Testing, including pump test of Well Nos. 3, 4 and 7 together.	$235,379.51	$235,379.51
TOTAL ACTUAL COST	Recapture of funds previously spent to prove well field capacity and feasibilty of concept	**$439,380**	**$439,380**
TOTAL REQUESTED FOR DWSRF FINANCING		**$4,529,380**	**$4,751,938**

EFC Direct Fees and Issuance Costs	1.7% of Total Requested (2010)		$80,783
		GRAND TOTAL	**$4,832,721**

TABLE 2

COMPARISON OF DEBT REPAYMENT OPTIONS

CONVENTIONAL LOAN	
$4,916,400 Bond, 30 Year Term, 5.75% Interest	
• First Year Principal Payment:	$ 65,000
• First Year Interest Payment:	$ 282,900
Total First Year Debt Payment:	**$ 347,900**
DWSRF EFC GUARANTEED LOAN	
$5,000,000 Bond, 30 Year Term, 5.75% Interest	
• First Year Principal Payment:	$ 65,000
• First Year Interest Payment:	$ 271,556
Total First Year Debt Payment:	**$ 336,556**
USDA FIXED RATE LOAD	
$4,916,400 Bond, 30 Year Term, 2.75% Interest	
• First Year Principal Payment:	$ 105,000
• First Year Interest Payment:	$ 135,300
Total First Year Debt Payment:	**$ 240,300**

VILLAGE BONDS

Dated: 9/15/2008
Delivered: 9/15/2008

Debt Service Schedule
Village of Wappingers Falls
$ 4,916,400 Village Bonds

PRIVATE

No Calls

Fiscal Yr	Coupon Date	Principal Payment	Coupon Rate	Interest Payment	Credit Enhancements	Periodic Debt Service	Fiscal Debt Service	Outstanding Debt
2009	3/15/2009			141,450.00	-	141,450.00	141,450.00	4,920,000.00
2010	9/15/2009	65,000.00	5.750	141,450.00	-	206,450.00	-	4,855,000.00
	3/15/2010			139,581.25	-	139,581.25	346,031.25	4,855,000.00
2011	9/15/2010	65,000.00	5.750	139,581.25	-	204,581.25	-	4,790,000.00
	3/15/2011			137,712.50	-	137,712.50	342,293.75	4,790,000.00
2012	9/15/2011	70,000.00	5.750	137,712.50	-	207,712.50	-	4,720,000.00
	3/15/2012			135,700.00	-	135,700.00	343,412.50	4,720,000.00
2013	9/15/2012	75,000.00	5.750	135,700.00	-	210,700.00	-	4,645,000.00
	3/15/2013			133,543.75	-	133,543.75	344,243.75	4,645,000.00
2014	9/15/2013	80,000.00	5.750	133,543.75	-	213,543.75	-	4,565,000.00
	3/15/2014			131,243.75	-	131,243.75	344,787.50	4,565,000.00
2015	9/15/2014	85,000.00	5.750	131,243.75	-	216,243.75	-	4,480,000.00
	3/15/2015			128,800.00	-	128,800.00	345,043.75	4,480,000.00
2016	9/15/2015	90,000.00	5.750	128,800.00	-	218,800.00	-	4,390,000.00
	3/15/2016			126,212.50	-	126,212.50	345,012.50	4,390,000.00
2017	9/15/2016	95,000.00	5.750	126,212.50	-	221,212.50	-	4,295,000.00
	3/15/2017			123,481.25	-	123,481.25	344,693.75	4,295,000.00
2018	9/15/2017	100,000.00	5.750	123,481.25	-	223,481.25	-	4,195,000.00
	3/15/2018			120,606.25	-	120,606.25	344,087.50	4,195,000.00
2019	9/15/2018	105,000.00	5.750	120,606.25	-	225,606.25	-	4,090,000.00
	3/15/2019			117,587.50	-	117,587.50	343,193.75	4,090,000.00
2020	9/15/2019	110,000.00	5.750	117,587.50	-	227,587.50	-	3,980,000.00
	3/15/2020			114,425.00	-	114,425.00	342,012.50	3,980,000.00
2021	9/15/2020	120,000.00	5.750	114,425.00	-	234,425.00	-	3,860,000.00
	3/15/2021			110,975.00	-	110,975.00	345,400.00	3,860,000.00
2022	9/15/2021	125,000.00	5.750	110,975.00	-	235,975.00	-	3,735,000.00
	3/15/2022			107,381.25	-	107,381.25	343,356.25	3,735,000.00
2023	9/15/2022	135,000.00	5.750	107,381.25	-	242,381.25	-	3,600,000.00
	3/15/2023			103,500.00	-	103,500.00	345,881.25	3,600,000.00
2024	9/15/2023	140,000.00	5.750	103,500.00	-	243,500.00	-	3,460,000.00
	3/15/2024			99,475.00	-	99,475.00	342,975.00	3,460,000.00
2025	9/15/2024	150,000.00	5.750	99,475.00	-	249,475.00	-	3,310,000.00
	3/15/2025			95,162.50	-	95,162.50	344,637.50	3,310,000.00
2026	9/15/2025	160,000.00	5.750	95,162.50	-	255,162.50	-	3,150,000.00
	3/15/2026			90,562.50	-	90,562.50	345,725.00	3,150,000.00
2027	9/15/2026	170,000.00	5.750	90,562.50	-	260,562.50	-	2,980,000.00
	3/15/2027			85,675.00	-	85,675.00	346,237.50	2,980,000.00
2028	9/15/2027	180,000.00	5.750	85,675.00	-	265,675.00	-	2,800,000.00
	3/15/2028			80,500.00	-	80,500.00	346,175.00	2,800,000.00
2029	9/15/2028	190,000.00	5.750	80,500.00	-	270,500.00	-	2,610,000.00
	3/15/2029			75,037.50	-	75,037.50	345,537.50	2,610,000.00
2030	9/15/2029	200,000.00	5.750	75,037.50	-	275,037.50	-	2,410,000.00
	3/15/2030			69,287.50	-	69,287.50	344,325.00	2,410,000.00
2031	9/15/2030	210,000.00	5.750	69,287.50	-	279,287.50	-	2,200,000.00
	3/15/2031			63,250.00	-	63,250.00	342,537.50	2,200,000.00
2032	9/15/2031	225,000.00	5.750	63,250.00	-	288,250.00	-	1,975,000.00
	3/15/2032			56,781.25	-	56,781.25	345,031.25	1,975,000.00
2033	9/15/2032	235,000.00	5.750	56,781.25	-	291,781.25	-	1,740,000.00
	3/15/2033			50,025.00	-	50,025.00	341,806.25	1,740,000.00
2034	9/15/2033	250,000.00	5.750	50,025.00	-	300,025.00	-	1,490,000.00
	3/15/2034			42,837.50	-	42,837.50	342,862.50	1,490,000.00
2035	9/15/2034	265,000.00	5.750	42,837.50	-	307,837.50	-	1,225,000.00

VILLAGE BONDS

Dated: 9/15/2008	*Debt Service Schedule*	*2*
Delivered: 9/15/2008	*Village of Wappingers Falls*	*No Calls*
	$ 4,916,400 Village Bonds	

Fiscal Yr	*Coupon Date*	*Principal Payment*	*Coupon Rate*	*Interest Payment*	*Credit Enhancements*	*Periodic Debt Service*	*Fiscal Debt Service*	*Outstanding Debt*
	3/15/2035			35,218.75	-	35,218.75	343,056.25	1,225,000.00
2036	9/15/2035	280,000.00	5.750	35,218.75	-	315,218.75	-	945,000.00
	3/15/2036			27,168.75	-	27,168.75	342,387.50	945,000.00
2037	9/15/2036	295,000.00	5.750	27,168.75	-	322,168.75	-	650,000.00
	3/15/2037			18,687.50	-	18,687.50	340,856.25	650,000.00
2038	9/15/2037	315,000.00	5.750	18,687.50	-	333,687.50	-	335,000.00
	3/15/2038			9,631.25	-	9,631.25	343,318.75	335,000.00
2039	9/15/2038	335,000.00	5.750	9,631.25	-	344,631.25	344,631.25	
		4,920,000.00		*5,543,000.00*		*10,463,000.00*		

True Interest Cost (TIC)	**5.7500000**	***Arbitrage Yield Limit (AYL)***	**5.7500000**
Net Interest Cost (NIC)	**5.7500000**	***Arbitrage Net Interest Cost (ANIC)***	**5.7500000**
Accrued Interest	**0.00**		

EFC BONDS

Dated: 9/15/2008	*Debt Service Schedule*	EFC	1
Delivered: 9/15/2008	*Village of Wappingers Falls*	GUARANTEE	*No Calls*
	$ 5,000,000 EFC Bonds		

Fiscal Yr	Coupon Date	Principal Payment	Coupon Rate	Interest Payment	Credit Enhancements	Periodic Debt Service	Fiscal Debt Service	Outstanding Debt
2009	3/15/2009			135,778.00	-	135,778.00	135,778.00	5,000,000.00
2010	9/15/2009	65,000.00	2.160	135,778.00	-	200,778.00	-	4,935,000.00
	3/15/2010			135,076.00	-	135,076.00	335,854.00	4,935,000.00
2011	9/15/2010	70,000.00	2.810	135,076.00	-	205,076.00	-	4,865,000.00
	3/15/2011			134,092.50	-	134,092.50	339,168.50	4,865,000.00
2012	9/15/2011	70,000.00	3.190	134,092.50	-	204,092.50	-	4,795,000.00
	3/15/2012			132,976.00	-	132,976.00	337,068.50	4,795,000.00
2013	9/15/2012	75,000.00	3.510	132,976.00	-	207,976.00	-	4,720,000.00
	3/15/2013			131,659.75	-	131,659.75	339,635.75	4,720,000.00
2014	9/15/2013	80,000.00	3.710	131,659.75	-	211,659.75	-	4,640,000.00
	3/15/2014			130,175.75	-	130,175.75	341,835.50	4,640,000.00
2015	9/15/2014	85,000.00	3.940	130,175.75	-	215,175.75	-	4,555,000.00
	3/15/2015			128,501.25	-	128,501.25	343,677.00	4,555,000.00
2016	9/15/2015	90,000.00	4.180	128,501.25	-	218,501.25	-	4,465,000.00
	3/15/2016			126,620.25	-	126,620.25	345,121.50	4,465,000.00
2017	9/15/2016	95,000.00	4.410	126,620.25	-	221,620.25	-	4,370,000.00
	3/15/2017			124,525.50	-	124,525.50	346,145.75	4,370,000.00
2018	9/15/2017	100,000.00	4.650	124,525.50	-	224,525.50	-	4,270,000.00
	3/15/2018			122,200.50	-	122,200.50	346,726.00	4,270,000.00
2019	9/15/2018	110,000.00	4.860	122,200.50	-	232,200.50	-	4,160,000.00
	3/15/2019			119,527.50	-	119,527.50	351,728.00	4,160,000.00
2020	9/15/2019	115,000.00	5.030	119,527.50	-	234,527.50	-	4,045,000.00
	3/15/2020			116,635.25	-	116,635.25	351,162.75	4,045,000.00
2021	9/15/2020	120,000.00	5.200	116,635.25	-	236,635.25	-	3,925,000.00
	3/15/2021			113,515.25	-	113,515.25	350,150.50	3,925,000.00
2022	9/15/2021	130,000.00	5.340	113,515.25	-	243,515.25	-	3,795,000.00
	3/15/2022			110,044.25	-	110,044.25	353,559.50	3,795,000.00
2023	9/15/2022	135,000.00	5.410	110,044.25	-	245,044.25	-	3,660,000.00
	3/15/2023			106,392.50	-	106,392.50	351,436.75	3,660,000.00
2024	9/15/2023	145,000.00	5.470	106,392.50	-	251,392.50	-	3,515,000.00
	3/15/2024			102,426.75	-	102,426.75	353,819.25	3,515,000.00
2025	9/15/2024	150,000.00	5.530	102,426.75	-	252,426.75	-	3,365,000.00
	3/15/2025			98,279.25	-	98,279.25	350,706.00	3,365,000.00
2026	9/15/2025	160,000.00	5.590	98,279.25	-	258,279.25	-	3,205,000.00
	3/15/2026			93,807.25	-	93,807.25	352,086.50	3,205,000.00
2027	9/15/2026	170,000.00	5.640	93,807.25	-	263,807.25	-	3,035,000.00
	3/15/2027			89,013.25	-	89,013.25	352,820.50	3,035,000.00
2028	9/15/2027	180,000.00	5.690	89,013.25	-	269,013.25	-	2,855,000.00
	3/15/2028			83,892.25	-	83,892.25	352,905.50	2,855,000.00
2029	9/15/2028	190,000.00	5.740	83,892.25	-	273,892.25	-	2,665,000.00
	3/15/2029			78,439.25	-	78,439.25	352,331.50	2,665,000.00
2030	9/15/2029	205,000.00	5.790	78,439.25	-	283,439.25	-	2,460,000.00
	3/15/2030			72,504.50	-	72,504.50	355,943.75	2,460,000.00
2031	9/15/2030	215,000.00	5.820	72,504.50	-	287,504.50	-	2,245,000.00
	3/15/2031			66,248.00	-	66,248.00	353,752.50	2,245,000.00
2032	9/15/2031	225,000.00	5.840	66,248.00	-	291,248.00	-	2,020,000.00
	3/15/2032			59,678.00	-	59,678.00	350,926.00	2,020,000.00
2033	9/15/2032	240,000.00	5.860	59,678.00	-	299,678.00	-	1,780,000.00
	3/15/2033			52,646.00	-	52,646.00	352,324.00	1,780,000.00
2034	9/15/2033	255,000.00	5.880	52,646.00	-	307,646.00	-	1,525,000.00
	3/15/2034			45,149.00	-	45,149.00	352,795.00	1,525,000.00
2035	9/15/2034	270,000.00	5.900	45,149.00	-	315,149.00	-	1,255,000.00

EFC BONDS

Dated: 9/15/2008	*Debt Service Schedule*	*2*
Delivered: 9/15/2008	*Village of Wappingers Falls*	*No Calls*
	$ 5,000,000 EFC Bonds	

Fiscal Yr	*Coupon Date*	*Principal Payment*	*Coupon Rate*	*Interest Payment*	*Credit Enhancements*	*Periodic Debt Service*	*Fiscal Debt Service*	*Outstanding Debt*
	3/15/2035			37,184.00	-	37,184.00	352,333.00	1,255,000.00
2036	9/15/2035	285,000.00	5.910	37,184.00	-	322,184.00	-	970,000.00
	3/15/2036			28,762.25	-	28,762.25	350,946.25	970,000.00
2037	9/15/2036	305,000.00	5.920	28,762.25	-	333,762.25	-	665,000.00
	3/15/2037			19,734.25	-	19,734.25	353,496.50	665,000.00
2038	9/15/2037	325,000.00	5.930	19,734.25	-	344,734.25	-	340,000.00
	3/15/2038			10,098.00	-	10,098.00	354,832.25	340,000.00
2039	9/15/2038	340,000.00	5.940	10,098.00	-	350,098.00	350,098.00	
		5,000,000.00		*5,611,164.50*		*10,611,164.50*		

True Interest Cost (TIC)	**5.7500000**	*Arbitrage Yield Limit (AYL)*	**5.7500000**
Net Interest Cost (NIC)	**5.7500000**	*Arbitrage Net Interest Cost (ANIC)*	**5.7500000**
Accrued Interest	**0.00**		

USDA BONDS

Dated: 9/15/2008
Delivered: 9/15/2008

Debt Service Schedule
Village of Wappingers Falls
$ 4,916,400 USDA Bonds

No Calls

Fiscal Yr	Coupon Date	Principal Payment	Coupon Rate	Interest Payment	Credit Enhancements	Periodic Debt Service	Fiscal Debt Service	Outstanding Debt
2009	3/15/2009			67,650.00	-	67,650.00	67,650.00	4,920,000.00
2010	9/15/2009	105,000.00	2.750	67,650.00	-	172,650.00	-	4,815,000.00
	3/15/2010			66,206.25	-	66,206.25	238,856.25	4,815,000.00
2011	9/15/2010	110,000.00	2.750	66,206.25	-	176,206.25	-	4,705,000.00
	3/15/2011			64,693.75	-	64,693.75	240,900.00	4,705,000.00
2012	9/15/2011	115,000.00	2.750	64,693.75	-	179,693.75	-	4,590,000.00
	3/15/2012			63,112.50	-	63,112.50	242,806.25	4,590,000.00
2013	9/15/2012	115,000.00	2.750	63,112.50	-	178,112.50	-	4,475,000.00
	3/15/2013			61,531.25	-	61,531.25	239,643.75	4,475,000.00
2014	9/15/2013	120,000.00	2.750	61,531.25	-	181,531.25	-	4,355,000.00
	3/15/2014			59,881.25	-	59,881.25	241,412.50	4,355,000.00
2015	9/15/2014	125,000.00	2.750	59,881.25	-	184,881.25	-	4,230,000.00
	3/15/2015			58,162.50	-	58,162.50	243,043.75	4,230,000.00
2016	9/15/2015	125,000.00	2.750	58,162.50	-	183,162.50	-	4,105,000.00
	3/15/2016			56,443.75	-	56,443.75	239,606.25	4,105,000.00
2017	9/15/2016	130,000.00	2.750	56,443.75	-	186,443.75	-	3,975,000.00
	3/15/2017			54,656.25	-	54,656.25	241,100.00	3,975,000.00
2018	9/15/2017	135,000.00	2.750	54,656.25	-	189,656.25	-	3,840,000.00
	3/15/2018			52,800.00	-	52,800.00	242,456.25	3,840,000.00
2019	9/15/2018	135,000.00	2.750	52,800.00	-	187,800.00	-	3,705,000.00
	3/15/2019			50,943.75	-	50,943.75	238,743.75	3,705,000.00
2020	9/15/2019	140,000.00	2.750	50,943.75	-	190,943.75	-	3,565,000.00
	3/15/2020			49,018.75	-	49,018.75	239,962.50	3,565,000.00
2021	9/15/2020	145,000.00	2.750	49,018.75	-	194,018.75	-	3,420,000.00
	3/15/2021			47,025.00	-	47,025.00	241,043.75	3,420,000.00
2022	9/15/2021	150,000.00	2.750	47,025.00	-	197,025.00	-	3,270,000.00
	3/15/2022			44,962.50	-	44,962.50	241,987.50	3,270,000.00
2023	9/15/2022	155,000.00	2.750	44,962.50	-	199,962.50	-	3,115,000.00
	3/15/2023			42,831.25	-	42,831.25	242,793.75	3,115,000.00
2024	9/15/2023	155,000.00	2.750	42,831.25	-	197,831.25	-	2,960,000.00
	3/15/2024			40,700.00	-	40,700.00	238,531.25	2,960,000.00
2025	9/15/2024	160,000.00	2.750	40,700.00	-	200,700.00	-	2,800,000.00
	3/15/2025			38,500.00	-	38,500.00	239,200.00	2,800,000.00
2026	9/15/2025	165,000.00	2.750	38,500.00	-	203,500.00	-	2,635,000.00
	3/15/2026			36,231.25	-	36,231.25	239,731.25	2,635,000.00
2027	9/15/2026	170,000.00	2.750	36,231.25	-	206,231.25	-	2,465,000.00
	3/15/2027			33,893.75	-	33,893.75	240,125.00	2,465,000.00
2028	9/15/2027	175,000.00	2.750	33,893.75	-	208,893.75	-	2,290,000.00
	3/15/2028			31,487.50	-	31,487.50	240,381.25	2,290,000.00
2029	9/15/2028	180,000.00	2.750	31,487.50	-	211,487.50	-	2,110,000.00
	3/15/2029			29,012.50	-	29,012.50	240,500.00	2,110,000.00
2030	9/15/2029	185,000.00	2.750	29,012.50	-	214,012.50	-	1,925,000.00
	3/15/2030			26,468.75	-	26,468.75	240,481.25	1,925,000.00
2031	9/15/2030	190,000.00	2.750	26,468.75	-	216,468.75	-	1,735,000.00
	3/15/2031			23,856.25	-	23,856.25	240,325.00	1,735,000.00
2032	9/15/2031	195,000.00	2.750	23,856.25	-	218,856.25	-	1,540,000.00
	3/15/2032			21,175.00	-	21,175.00	240,031.25	1,540,000.00
2033	9/15/2032	200,000.00	2.750	21,175.00	-	221,175.00	-	1,340,000.00
	3/15/2033			18,425.00	-	18,425.00	239,600.00	1,340,000.00
2034	9/15/2033	205,000.00	2.750	18,425.00	-	223,425.00	-	1,135,000.00
	3/15/2034			15,606.25	-	15,606.25	239,031.25	1,135,000.00
2035	9/15/2034	215,000.00	2.750	15,606.25	-	230,606.25	-	920,000.00

Dated: 9/15/2008	*Debt Service Schedule*	2
Delivered: 9/15/2008	*Village of Wappingers Falls*	*No Calls*
	$ 4,916,400 USDA Bonds	

Fiscal Yr	*Coupon Date*	*Principal Payment*	*Coupon Rate*	*Interest Payment*	*Credit Enhancements*	*Periodic Debt Service*	*Fiscal Debt Service*	*Outstanding Debt*
	3/15/2035			12,650.00	-	12,650.00	243,256.25	920,000.00
2036	9/15/2035	220,000.00	2.750	12,650.00	-	232,650.00	-	700,000.00
	3/15/2036			9,625.00	-	9,625.00	242,275.00	700,000.00
2037	9/15/2036	225,000.00	2.750	9,625.00	-	234,625.00	-	475,000.00
	3/15/2037			6,531.25	-	6,531.25	241,156.25	475,000.00
2038	9/15/2037	230,000.00	2.750	6,531.25	-	236,531.25	-	245,000.00
	3/15/2038			3,368.75	-	3,368.75	239,900.00	245,000.00
2039	9/15/2038	245,000.00	2.750	3,368.75	-	248,368.75	248,368.75	
		4,920,000.00		*2,374,900.00*		*7,294,900.00*		

True Interest Cost (TIC)	2.7500000	*Arbitrage Yield Limit (AYL)*	2.7500000
Net Interest Cost (NIC)	2.7500000	*Arbitrage Net Interest Cost (ANIC)*	2.7500000
Accrued Interest	0.00		

APPENDIX "B"

- IRON MIGRATION MEMORANDUM
- WELL NO. 7 TESTING AND COMPLETION REPORT

MEMORANDUM

TO: Joseph Paggi

FROM: Kenneth Taylor
Thomas Cusack

DATE: December 5, 2006

SUBJECT: Village of Wappinger Falls Well Field

The Village has requested that Leggette, Brashears & Graham, Inc. (LBG) evaluate if the pumping rates (listed below) for Productions Wells Nos. 3, 4 and 7 recommended in the November 2005 report entitled "Well 7 Completion Report, Village of Wappinger Falls, New York" can be sustained over time with respect to water-quality issues related to iron. This is of particular interest to the Village because of the investment in infrastructure (i.e,. filtration plant, chlorine detention facilities, etc.) necessary to withdrawal water at the listed rates.

Well ID	Pumping Rate (gpm)
Well No. 3	152
Well No. 4	375
Well No. 7	504

Background

In 2003, Leggette, Brashears & Graham, Inc. (LBG) was retained to conduct a comprehensive study of the Village of Wappingers Falls' (the Village) water-supply well field. As part of the study, LBG reviewed all available hydrogeologic data, supervised the completion of test borings and wells, collected soil and ground-water samples and completed an aquifer test of Production Well No. 3. The objectives of the study were as follows:

1. Investigate the cause of elevated iron concentrations in Production Well No. 5 and, to a lesser degree, in Production Well No. 4. Both wells were offline because of elevated iron.

2. Obtain hydrogeologic data from the western portion of the well field and, if possible, recommend potential locations for a future production well.

The results of this study suggested that the presence of oxygenated, iron-rich water found in the lake may act as a catalyst for highly aggressive bacterial colonies. The presence of these bacterial colonies in Production Wells Nos. 4 and 5 appear to be the cause of the high concentration of iron documented in each well that has lead to the wells being taken out of service. While a consortium of bacteria was also detected in Production Well No. 3, there has been no significant degradation of the quality of the water withdrawn from this well due to the fact that it does not draw water from the lake (or the same portion of the lake as Well Nos. 4 and 5).

The net result of the study was the development, construction and testing of Well No. 7. The location of Well No. 7 was selected based on setback distances (approximately 200 feet) from existing Production Wells Nos. 3 and 4, New York State Department of Health regulatory setback requirements (100-foot radius of ownership and 200-foot radius of sanitary control). In addition, Well No. 7 was located over 400 feet from Wappinger Lake to minimize the potential of capturing the relatively warm iron-rich, oxygenated lake water responsible for the elevated iron levels in Well No. 5.

Discussion

It is difficult to ascertain with any degree of certainty the potential of the conditions observed in Well No. 5 (highly aggressive bacterial colonies being stimulated by the presence of oxygenated, relatively warm, iron-rich lake water) being duplicated in Wells Nos. 3, 4 and 7 at the proposed withdrawal rates. This is especially the case over a period of 5 to 10 years when there can be significant changes to individual well withdrawal rates (affecting capture zone and travel time), lake water chemistry (effecting dissolved oxygen and nitrogen concentration).

- Based on the available data, there is a low to moderate probability of the water quality in Well No. 3 degenerating (with respect to iron) because of the proposed withdrawal rates. The risk is moderate because a consortium of bacteria has been detected in Production Well No. 3. This was of limited concern in the past because past analysis has shown that the well did not draw water from the lake (or the same portion of the lake as Well No. 5). However, preliminary results from an analytical ground-water flow model suggest that if the proposed combined withdrawal rates are maintained until steady-state, water from the lake would likely migrate to the well. This is not considered a great risk because it is unlikely that the proposed withdrawals would be maintained for a prolonged time (multiple months) considering the Village's demand.

- The probability of continued degradation of Well No. 4's water quality (with respect to elevated iron concentration) is potentially very high. Well No. 4's history of elevated iron and close proximity to Wappinger Lake increase the likelihood that conditions observed in Well No. 5 could be duplicated in Well No. 4.

- Because of the geometry of the well field, the probability of the lake water migrating to Well No. 7 is low. If the well field were to be pumped at the proposed rates, Well Nos. 3 and 4 are located such that they would intercept any lake water migrating toward Well No. 7.

Recommendations

1. Bacterial Analysis Reaction Test (BART) should be completed quarterly to monitor the aggressivity of any bacteria consortium in the production wells. If or when a highly aggressive consortium of bacteria are detected in a production well, steps should be taken to rehabilitate the wells as quickly as possible using chemicals specifically designed to target iron-related bacteria. From LBG's experience, Unicid chemicals formulated by Design Water Technologies are the most effective for this type of bacterial growth.

2. The Village should consider using Well No. 5 (at a reduced rate) as an interceptor well to prevent lake water from reaching production Well Nos. 3 and 7.

3. A simplified scholastic analytical model should be developed to approximate probable capture area of the production wells at different withdrawal rates. Results from this analysis would be used to evaluate the effectiveness of using Well No. 5 as a blocking well or site other potential blocking wells.

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WELL 7 COMPLETION REPORT
VILLAGE OF WAPPINGER FALLS
NEW YORK

Prepared For:

The Village of Wappinger Falls

November 2005

Revised: October 2006

Prepared By:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
4 Research Drive, Suite 301
Shelton, CT 06484

TABLE OF CONTENTS

LIST OF TABLES

<u>Table</u>

LIST OF FIGURES

<u>Figure</u>

LIST OF APPENDICES
(at end of report)

<u>Appendix</u>

WELL 7 COMPLETION REPORT
VILLAGE OF WAPPINGER FALLS
NEW YORK

INTRODUCTION

This report documents the drilling, construction and testing of Production Well 7 at the Village of Wappinger Falls (Village) well field in Wappinger Falls, New York. The Village plans to develop this well to augment the existing production wells at the well field. The information gained from the drilling and testing program were used to established the long-term yield of Well 7. Figure 1 identifies the location of the well field.

HYDROGEOLOGY OF THE WELL FIELD

The Village Well Field is located in a riverside lowland in Wappingers, Dutchess County, in southeastern New York. The aquifer for the Village well field is part of the Hudson River Basin within the North Atlantic Slope Basins. The aquifer mainly consists of unconsolidated outwash and ice-contact deposits of Quaternary age. These deposits overlie sedimentary bedrock units consisting of shales and siltstones of Middle Ordovician age.

Test borings indicate that the unconsolidated aquifer deposits are up to 120 feet in thickness. The unconsolidated sediments were deposited by meltwater from Pleistocene glaciers. These borings illustrate that the glacial deposits beneath the well field consist primarily of layers of medium to coarse sand interbedded with layers of medium to fine sand, and with isolated pockets of silt and clay.

The Village well field is located immediately adjacent to Wappinger Lake. The lake acts as the eastern border of the well field (figure 2). Based upon data presented in a report entitled "Well Field Study, Village of Wappinger Falls, New York" (LBG, 2003), the vertical hydraulic conductivity of the lake bottom sediments is relatively impermeable but, because of its overall size, the lake acts as a major recharge source for the unconsolidated aquifer.

Extent of the Stratified-Drift Aquifer

Figure 3 shows the areal extent of the primary water-bearing unit, the stratified drift, for this section of the Hudson River Basin. The extent of the stratified drift is delineated by the stratified-drift/till contact. The stratified-drift/till contacts were mapped using the published surficial geology maps of New York, Lower Hudson Sheet (Cadwell et al., 1986).

Composition of Bedrock

The bedrock unit of the Middle Ordovician-age Trenton Group and metamorphic equivalents underlie the area. The underlying unit is identified as Austin Glen Formation, which consists of shale and graywacke (Fisher et al., 1970). Test borings indicate that the elevation of bedrock in the Village well field ranges from 18 to 38 feet amsl (above mean sea level).

DRILLING EXPLORATION PROGRAM

The test well and drilling program included the drilling and installation of two additional monitor wells installed at the well field, bringing the total number of monitor wells at the well field site to 10 (6 installed in 2003 by Aquifer Drilling and Testing, Inc. and two installed in 2004 by Connecticut Test Boring, Inc.). Geologic data obtained from the new test borings (TW No.1-05 and TW No. 2-05) were used to obtain a better understanding of the thickness and the complex nature of the stratified-drift deposits at the well field, and the vicinity of Well 7.

The borings were completed as monitor wells between April 20 and 26, 2005, by Layne Christenson Company (Layne) of Dracut, Massachusetts. TW No. 1-05 and TW No. 2-05 were drilled to bedrock (106 ft bg (feet below grade) and 92 ft bg, respectively). The bottom 10 feet of both wells were screened with 2-inch diameter, 10-slot PVC screen. Because the depth to water in each well was greater than 65 ft bg, the wells could not be effectively developed or pump tested. The geological logs for borings and monitor wells are shown in Appendix I.

INSTALLATION OF PRODUCTION WELL 7

Geologic logs and sieve data from the sediment samples collected during the drilling program were used along with geophysical data to select TW No. 1 as the favorable location for a high-yield production well.

Well 7 was drilled and constructed by Layne in September 2005. The well was drilled to a depth of 99 ft bg utilizing the cable tool method. Based upon the sieve analyses from TW No. 1 and sediment samples collected during the drilling of Well 7, a 12-foot screen zone was selected and installed from 87 to 99 ft bg. The well completion included 24-inch protective steel casing,12 feet of 16-inch, 90-slot, wire-wrapped, stainless-steel screen, and 87 feet of 16-inch diameter steel riser pipe. FilterSil Well Gravel # 4 was place from 77 to 99 ft bg.

The selected screen zone and screen have a theoretical transmitting capacity of approximately 1,260 gpm to keep entrance velocities within acceptable criteria (0.1 ft/sec). The sustainable yield of the well is determined by a pumping test and should never exceed the theoretical transmitting capacity of the screen. This is because, exceeding the transmitting capacity of the screen could cause rapid well deterioration and eventually the need for replacement. Upon completion of the installation of the well screen, the 24-inch diameter casing was grouted in palace from 5 to 27 ft bg and the temporary 36-inch casing was removed. The well construction diagram is included in Appendix II.

Layne developed the well for five days, and the final specific capacity reported for the new wells was approximately 68 gpm/ft (gallons per minute per foot of drawdown) at a pumping rate of 600 gpm.

STEP TEST

LBG conducted a step test on Well 7 on September 6, 2004. The step test was completed to determine a pumping rate for the 72-hour aquifer test and approximate well efficiency by determining the ratio of laminar head loss to total head loss as water flows through the well screen. A step test is a short-term aquifer test where the pumping rate is varied over time. For Well 7, the first step was started at 200 gpm. The other pumping rates for the test were 400 and

600 gpm. Each step was run for 100 minutes with no recovery between steps. Figure 4 is a plot of depth to water versus time during the step test, and table 1 summarized the step test results. Based on these results it was determined that Well 7 was capable of pumping 600 for the duration of the 72-aquifer test.

Figure 4 – Drawdown Versus Time Relationship

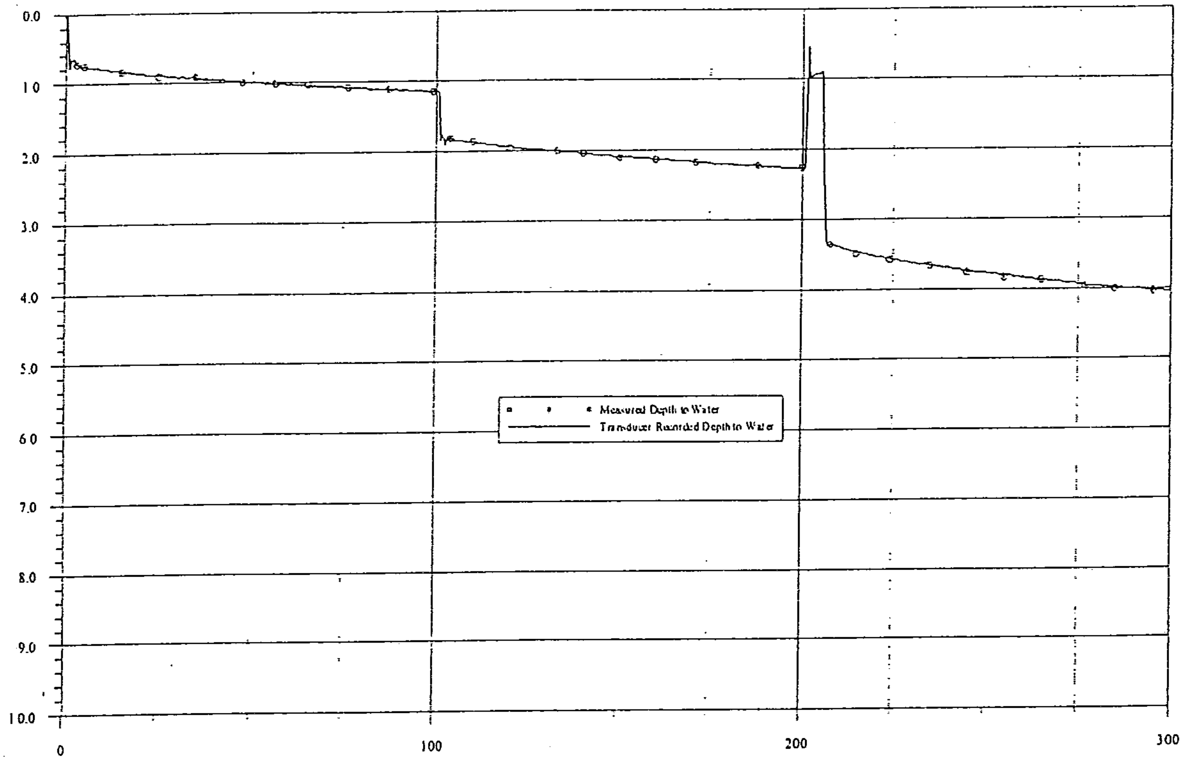

Table – 1 Summary of Step-Test Results

Pumping Rate (gpm)	Drawdown in Production Well (feet)	Specific Capacity (gpm/ft)
200	1.14	175
400	2.30	175
600	4.10	146

Head Loss (efficiency) Analysis

Drawdown in wells can be separated into two components. The first component is drawdown due to formation loss as predicted by radial flow equations; the second component is drawdown due to well losses caused by flow through the well screen and flow inside the well to the pump intake. This is represented by the equation:

$$S = BQ + CQ^2 \qquad \text{(Jacob, 1946)}$$

Where:

S = total drawdown in the well
B = formation loss coefficient
C = well loss coefficient
Q = pumping rate

The formation loss term, BQ, is often considered the laminar-flow term and CQ^2, the well loss term, is considered the turbulent-flow term.

Rearranging the above equation above, allows for determining the B and C coefficients by plotting $\frac{S}{Q}$ versus Q.

$$\frac{S}{Q} = B + CQ$$

The y-Axis intercept at zero discharge is the B coefficient and the Slope of the line is the C coefficient. Figure 5 shows the determination of B and C for the Well 7. The ratio of laminar to total head losses (approximation of well efficiency), L_p (%) is defined by,

$$L_p = \frac{BQ}{S} * 100$$

Where:

L_p = ratio of laminar to total head loss in percent (approximate efficiency)
BQ= formation loss
S = actual measured drawdown in well

Figure 5 – Determination of B and C Constants

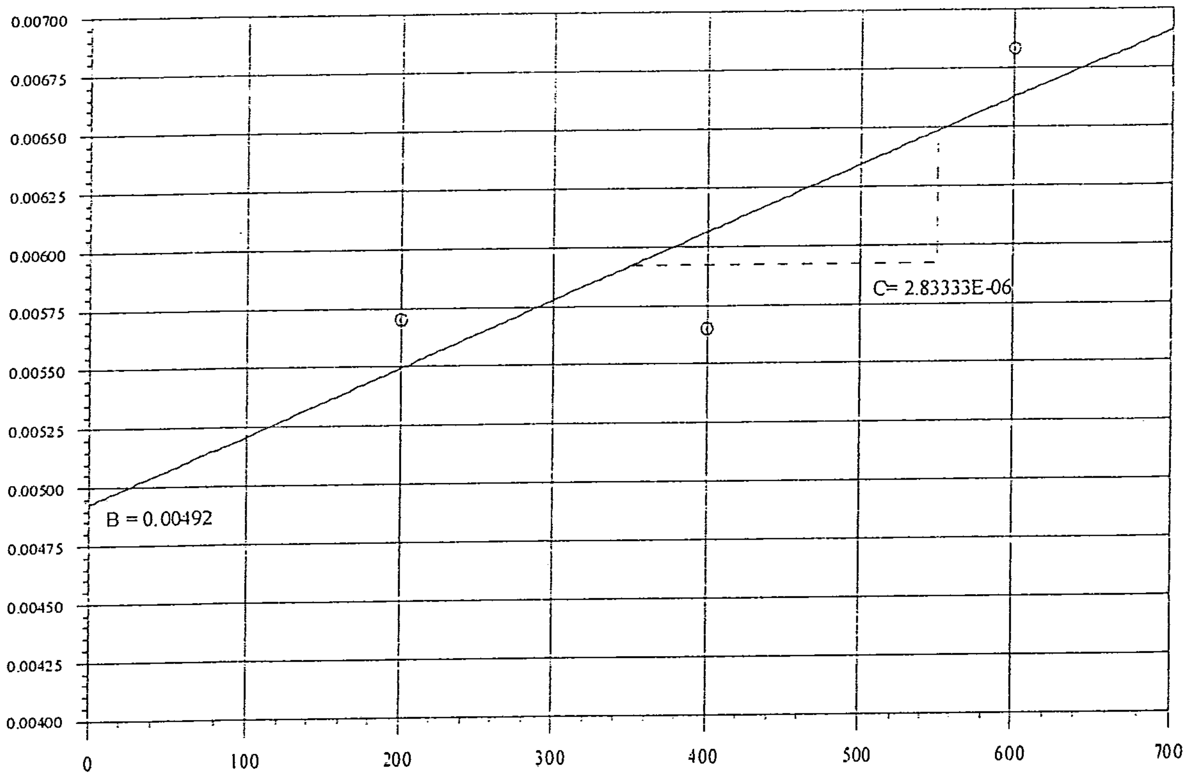

Table 2 shows the results of the head loss ratio or well efficiency calculations. There are other methods used to estimate well efficiency which give difference results. The results on table 2 should primarily be used as an additional indicator of reduced efficiency with increasing pumping rates.

Table 2 – Ratio of Laminar to Total Head Loss (approximate well efficiency)

Pumping Rate (gpm)	Lp (percent)
200	86
400	86
600	72

The data generated during this step test well provide a good basis of comparison for future evaluations of the condition of the well.

AQUIFER TESTS

Two aquifer tests were run in the Village of Wappinger Falls well field. The first test was a 72-hour test conducted from September 13 to September 16, 2005 on new production Well 7 and the second test was a 24-hour test completed from September 19 and 20, 2005 on Wells 3, 4 and 7. The withdrawal from existing production Well 3 was held constant at 330 gpm throughout the testing period (September 12 through 21, 2005) to enable the Village to meet system demands. Data collected during the aquifer tests were used to evaluate the long-term yield of new Well 7 as well as the combined well field sustainable yield.

During each of the tests, Measurements were collected manually and/or with pressure transducers to an accuracy of one hundredth of a foot from Well 7, Production Well 3, Production Well 4 and nine monitor wells ranging in distance from 10 to 376 feet from Well 7. Pressure transducers were installed in Well 7 and in eight monitoring wells on September 12, 2005. These transducers were used to monitor the water level in these wells prior to the start of the test. Figure 2 shows the location of the wells. Hydrographs and tables show depth to water versus time for these wells are located in the Appendix III.

72-Hour Aquifer Test

The test pump and appurtenances for Well 7 were installed by Layne on September 5, 2005. A 1-inch diameter plastic access tube was installed to accommodate pressure transducer installation and manual measurements. The pumping rate was measured with a 6-inch by 4-inch pipe-orifice weir. The water was discharged to the bank of Wappinger Lake through a fire hose. Plywood was used to prevent erosion of the lake bank.

The pumping test for Well 7 was started at 10:00 am on September 13, 2005 and it was shut down at 10:00 am on September 16, 2005. The pumping rate which was established during a step test conduction on September 6, 2005, was 603 gpm. The well maintained the 603 gpm rate until the test was terminated. The final pumping level was about 73.0 ft bg or 16.5 feet above the top of the screen.

No precipitation was recorded during the background period (September 11 and 12, 2005) and recovery phases of the test. During the pumping phase of the 72-hour aquifer test, 0.20 inch and 0.24 inch of precipitation of precipitation were recorded on September, 15 and 16, respectively. No precipitation was recorded during the pumping phase of the 24-hour aquifer test. Recorded precipitation magnitude and duration are shown on the hydrographs in Appendix III.

Water-level drawdown in the pumping well over the last 12 hours of the test was 0.54 foot and in the last 6 hours of the test, the water level dropped less than 0.30 foot. Drawdown stabilization was achieved at a constant rate for the last six hours of the test. The total drawdown at the end of the test was 8.33 feet for a specific capacity of 72.4 gpm/foot of drawdown.

After the test was terminated, recovery measurements were made in Well 7 for approximately 4 hours, with an additional 72-hours post-test measurement by pressure transducer. The water-level plot and table given in Appendix III shows the water level in Well 7 recovered from a final pumping level of 73.0 feet to 69.0 feet in four hours, a 47-percent recovery, and to 65.8 feet after 72 hours, an 86-percent recovery. The well did not achieve 100-percent recovery because of interference related to the continued pumping of Well 3.

24-Hour Aquifer Test

A 24-hour aquifer test was run for the Village of Wappinger Falls well field from September 19 and 20, 2005. Data collected during this test were used to evaluate the long-term yield of the well field. The new production well (Well 7) and existing Wells 3 and 4 were pumped simultaneously at a combined constant rate of 1,323 gpm (1.9 million gallons per day (mgd)) for 24 hours. During the test, the pumping rates for Wells 3, 4 and 7 were 330 gpm, 390 gpm, and 603 gpm, respectively. The water from Wells 4 and 7 was discharged to the bank of Wappinger Lake through fire hoses. Plywood was used to prevent erosion of the lake bank. The water from Well 3 was pumped into the distribution system.

As expected, because of the short duration of the test, the water-level drawdown in the pumping wells did not stabilize during the test. Water-level drawdowns in the pumping wells over the last six hours of the test were 1.42, 0.32 and 0.69 foot for Wells 3, 4 and 7, respectively.

The total drawdown for each of the production wells at the end of the test is shown on table 3, along with the calculated specific capacity for each of the production wells.

Table 3 – Specific Capacity at End of 24-Hour Aquifer Test

Well ID	Pumping Rate (gpm)	Drawdown (feet)	Specific Capacity (gpm/ft)
Well 3	330	27.1	12.2
Well 4	390	23.1	16.9
Well 7	603	11.6	52.0

SUSTAINABLE YIELD

The data from the 72-Hour and 24-hour aquifer tests were used along with data presented in the "Well 3 Pumping Test Report, Village of Wappinger Falls, New York in January of 2004 to evaluate the sustainable yield of Well 7 and the maximum sustainable yield of the well field as a whole. The data from the 72-hour aquifer test shows that Wells 7 and 3 can be pumped independently or simultaneously at 603 gpm and 330 gpm, respectively. The results from the 72-hour test also show that the combined capacity of Production Well 3 and 7 is 933 gpm or about 1.3 mgd. Based on the results of the 24–hour aquifer test, Wells 3, 4 and 7 can be pumped independently or simultaneously at a combined rate of 1,323 gpm (1.9 million gallons per day (mgd)) for at least 24 hours.

Long-Term Yield

Data from the aquifer test show that Production Wells 3, 4 and 7 can be pumped simultaneously at the rates listed in table 4. To evaluate if the proven capacity of each of the wells can be maintained during an extended dry period, the available drawdown was projected after 180 days of continuous pumping. Available drawdown was determined as the amount of water above each of the production-well screen settings. Table 4 shows the available drawdown from the 24-hour aquifer test for each active well. Data from the 24-hour aquifer test were used for this analysis because mutual well interference between the three wells being tested is already incorporated into the calculations.

The specific capacity of each of the production wells was determined by dividing the pumping rate of each production well by the drawdown measured in the well prior to the end of the aquifer test. The specific capacity was then adjusted to account for the additional drawdown after 180 days of pumping and multiplied by the projected available drawdown minus 3 feet (to be conservative) to determine the well's potential yield. The calculated 180-day sustainable yield for the new well and two existing wells are shown on table 4.

Table 4 – Pumping Capacity Analysis Based on Above-Referenced Aquifer Test

	Well 3	Well 4	Well 7
Pumping Test Rate (gpm)	330	390	603
Drawdown at end of test (feet)	27.1	23.1	11.6
Specific Capacity (gpm/ft of drawdown)	12.2	16.9	52
Projected Specific capacity after 180 days (gpm/ft of drawdown)	6.1	13.3	24.4
Three feet minus available drawdown after 180 days of pumping (feet)	-29.2	-1.1	-4.1
Additional pumping capacity (gpm)	-178.2	-14.9	-99.2
Sustainable Long Term Yield (gpm) (Test Rate + Additional capacity)	152	375	504

The calculated sustainable yields for Wells 3, 4 and 7 pumping simultaneously for 180 days of continuous pumping are shown on table 4. The values in the table show that the wells would not be able to maintain their proven capacity during extended dry periods.

Table 5 shows the calculated sustainable yield for Wells 3, 4 and 7 pumping simultaneously for 30, 60, 90 and 180 days. The 30- 60- and 90-day sustainable yields were calculated using the same methodology used to determine the 180-day sustainable yield.

Table 5 – Sustainable Yield Versus Time

Well ID	Sustainable Yield following 30 days of continuous pumping (gpm)	Sustainable Yield following 60 days of continuous pumping (gpm)	Sustainable Yield following 90 days of continuous pumping (gpm)	Sustainable Yield following 180 days of continuous pumping (gpm)
Well 3	182	169	162	152
Well 4	404	393	386	375
Well 7	611	564	539	504
Total	1197	1125	1088	1,031

LBG utilized a spreadsheet program called SAFEYIELD (developed by LBG) to evaluate the well field sustainable yield under different pumping scenarios. Before the program was run, the following data derived from the above-referenced aquifer tests were entered into the worksheet:

- Pumping rate during aquifer test
- Static depth to water
- Depth to water at the end of the pumping test
- Depth to the top of the well screen
- Depth to bottom of the well screen
- Maximum theoretical transmitting capacity of the well screen
- The x and y coordinates of each production well
- Transmissivity and specific yield of the aquifer
- Length of the aquifer test
- Drawdown over the last six hours of testing.

With the above list of input parameters, SAFEYIELD calculated the projected available drawdown after 180 days of pumping (with no recharge); the specific capacity of the well and mutual well interference. A theoretical drawdown-distance relationship was used to project mutual well interference. The calculated well interference was then subtracted from the available drawdown. The new available drawdown value was multiplied by the specific capacity and added to the aquifer test pumping rate to obtain the potential well yield.

After the initial calculations, the program ran checks to ensure that the available drawdown in each active well was greater than zero and that the drawdown in the inactive wells was less than the saturated aquifer thickness. If the above-referenced conditions had not been achieved, the program adjusted the pumping rates of all the active wells automatically and recalculated the potential yield of each active well until they had been achieved. The program then adjusted the pumping rates until the maximum rate was found that met the prescribed conditions.

Table 6 shows the sustainable yield for four pumping scenarios. For the first scenario, all three wells were active. For the second pumping scenario, Wells 3 and 4 were active and for Scenarios 3 and 4, Wells 3 and 7 and Wells 7 and 4 were active, respectively.

Table 6 – Sustainable Yield for Different Pumping Scenarios

Wells	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Active Wells	Pumping Rate (gpm)	Active Wells	Pumping Rate (gpm)	Active Wells	Pumping Rate (gpm)	Active Wells	Pumping Rate (gpm)
Well 3	X	152	X	194	X	164		
Well 4	X	375	X	390			X	390
Well 7	X	504			X	556	X	600
Total	**3**	**1,031**	**2**	**584**	**2**	**720**	**2**	**990**

The withdrawal rates listed in the table above are reflective of the estimated maximum rate each well can be pumped during an extended drought. These rates are not reflective of the recommended or ideal pumping rates under typical conditions. The optimized rates for each of the scenarios were capped to the proven capacity during the 24-hour aquifer test. The optimized withdrawal rates for each of the scenarios did not decrease despite the 180-day drought period of continuous pumping. The rates stay at the proven capacity because removing Well 3 from the scenario increases the available drawdown by eliminating projected well interference.

AREA OF INFLUENCE CALCULATION

The area of influence (AOI) for Well 7 was calculated with a pumping rate of 603 gpm. The AOI for the well was derived using the drawdown versus distance derivation of the Jacob straight line method. The Jacob method is a semi-logarithmic graphical analysis in which drawdown at any distance can be calculated if aquifer parameters and the well's pumping rate is known.

Calculation of Aquifer Parameters

The drawdown versus distance derivation of the Jacob's method was used to calculate the transmissivity and storage coefficient for the September 13-16, 2005 aquifer test of Well 7. The Jacobs's drawdown versus distance derivation uses semi-logarithmic graphical analysis to calculate transmissivity and specific yield (Cooper and Jacob, 1946).

Regional water elevations prior to the aquifer test showed that it was necessary to correct the measured drawdown data because of interference effects related to Well 3. In addition, no correction was made for partial penetration effects. The aquifer parameters for the tests were calculated using drawdown after three days of pumping. The data for the tests were not corrected for water-table conditions in these calculations because the drawdown was small compared to the saturated thickness.

The pumping test analysis for the 2005 aquifer test of Well 7 are shown on the drawdown versus distance plot (figure 6). The transmissivity and specific yield values calculated for the Well 7 aquifer test are 28,660 gpd/ft (gallons per day per foot) and 0.06, respectively.

The specific yield value calculated from the aquifer test data is typical of an aquifer with discontinuous semi-confining silt and clay layers in some portion of the aquifer. A review of the production well log confirms the existence of a 6 foot thick silt and clay unit between 77 ft bg and 83 ft bg. This semi-confining unit was not detected in TW-01-05 or TW-02-05 located 10 feet and 78 feet from Well 7, respectively. It is hypothesized that the semi-confining unit partially isolates wells located in close proximity (180 feet or less) to Well 7 from the full impact of pumping. This explains why wells located close to Well 7 showed less drawdown than predicted on the drawdown versus distance plot (figure 6).

Calculation of AOI

The above-referenced transmissivity and specific yield were used to construct the theoretical drawdown versus distance plot used to calculate the AOC. To construct a drawdown versus distance plot, the Cooper-Jacob drawdown versus distance derivation of the Theis equation was first solved for DS.

$$DS = \frac{528Q}{T}$$ (Cooper and Jacob, 1946)

where,

DS	=	slope over one log cycle of drawdown versus distance plot (ft/ft)
Q	=	permitted pumping rate (gpm)
T	=	transmissivity (gpd/ft)

After DS was determined, ZI was calculated using the following equation:

$$ZI = \sqrt{\frac{Tt0.3}{S}}$$

(Cooper and Jacob, 1946)

where,

ZI	=	distance at which drawdown is zero (feet)
T	=	transmissivity (gpd/ft)
t	=	time since pumping started (days)
S	=	specific yield

Based on the calculated values of DS and ZI, a theoretical drawdown versus distance plot was constructed. DS and ZI were calculated assuming Well 7 is pumping at a rate of 603 gpm for 10 consecutive days. Information from the well field completion tests show that the water level in the wells stabilized after three days of pumping. Ten days were used for the construction of the drawdown versus distance plot to be conservative. The ten-day time frame was necessary because the equation does not simulate the effects of leakage from Wappinger Lake which is the cause of stabilization. In addition, using the 180 days in the analysis as recommended in the New York State Department of Environmental Conservation Pump Test Procedures would produce an unrealistically large (approximately 5,100 feet) AOI because Well 7 achieved stabilization after 72-hours of pumping.

Area of Influence

For this analysis, the AOI is the area of land in which the water table is predicted to be impacted by projected Well 7 withdrawals. Therefore, based on figure 5, zero drawdown occurs at a radius of approximately 1,200 feet.

WATER QUALITY

Water samples were taken by LBG from Well 7 during the 72-hour test at 1:00 p.m. on September 15, 2005. The samples were delivered to OCL Analytical Services. Copies of the water quality reports are located in Appendix IV. All parameters were found at levels below permissible limits and meet NYSDOH drinking water standards. The sodium concentration in

Well7 was reported at 51 mg/l. The NYSDOH has no designated limits for sodium. Water containing more than 20 mg/l of sodium should not be used for drinking by people on severely restricted sodium diets.

The analysis also included microparticulate analysis (MPA) to determine if the wells are under the direct influence of surface water as defined under the Surface Water Treatment Rule. The MPA analysis indicated nondetect for all parameters of concern.

CONCLUSIONS

1. Results from the step test analysis show that shows the ratio of laminar head loss to total head loss (or estimated general well efficiency) of Well 7 was approximately 72 percent at 600 gpm.

2. Based on the results of the 24-hour and 72-hour aquifer tests, Well 7 can sustain an individual yield of 600 gpm during a drought if pumped individually or with Well 4. If Well 3 is operated at the same time as Well 7, the sustainable yield for Wells 3 and 7 are 164 gpm and 556 gpm, respectively, for a combined rate of 720 gpm.

3. The results from the aquifer tests also show that the sustainable yield for Well 3 and Well 4 (without Well 7), when pumped simultaneously, are 194 gpm and 390 gpm, respectively, for a combined rate of 584 gpm.

4. Based on the results from the sustainable yield analysis, the Village well field with all three wells pumping has a maximum 180-day sustainable yield of 1,031 gpm or 1.48 mgd.

5. Data from the MPA and water-quality data collected during the aquifer test indicate a low risk of direct hydraulic connection between the Well 7 and the lake.

LEGGETTE, BRASHEARS & GRAHAM, INC.

Kenneth Taylor
Associate

Reviewed by:

Thomas P. Cusack, CPG
Principal

R. G. Slayback, CPG
Principal

cmm
November 30, 2005
Revised: October 4, 2006
H:\Wappingers Falls\2005\wappingers 72.doc

REFERENCES

Cadwell, D.H., Connally, G.G., Dineen, R.J., Fleisher, P.J., Fuller, M.L., Sirkin, L, and Wiles, G.C., 1989, "Surficial Geology Map of New York, Lower Hudson Sheet", "The University of the State of New York, the State Education Department".

Fisher, DW., Isachsen, Y.W., Rickard, L.V., 1970, "Geologic Map of New York, 1970, Reprinted 1995, Lower Hudson Sheet"; "The University of the State of New York, the State Education Department".

Jacob, C. E., "Drawdown Test to Determine Effective Radius of Artesian Well", Paper No. 2321, May, 1946.

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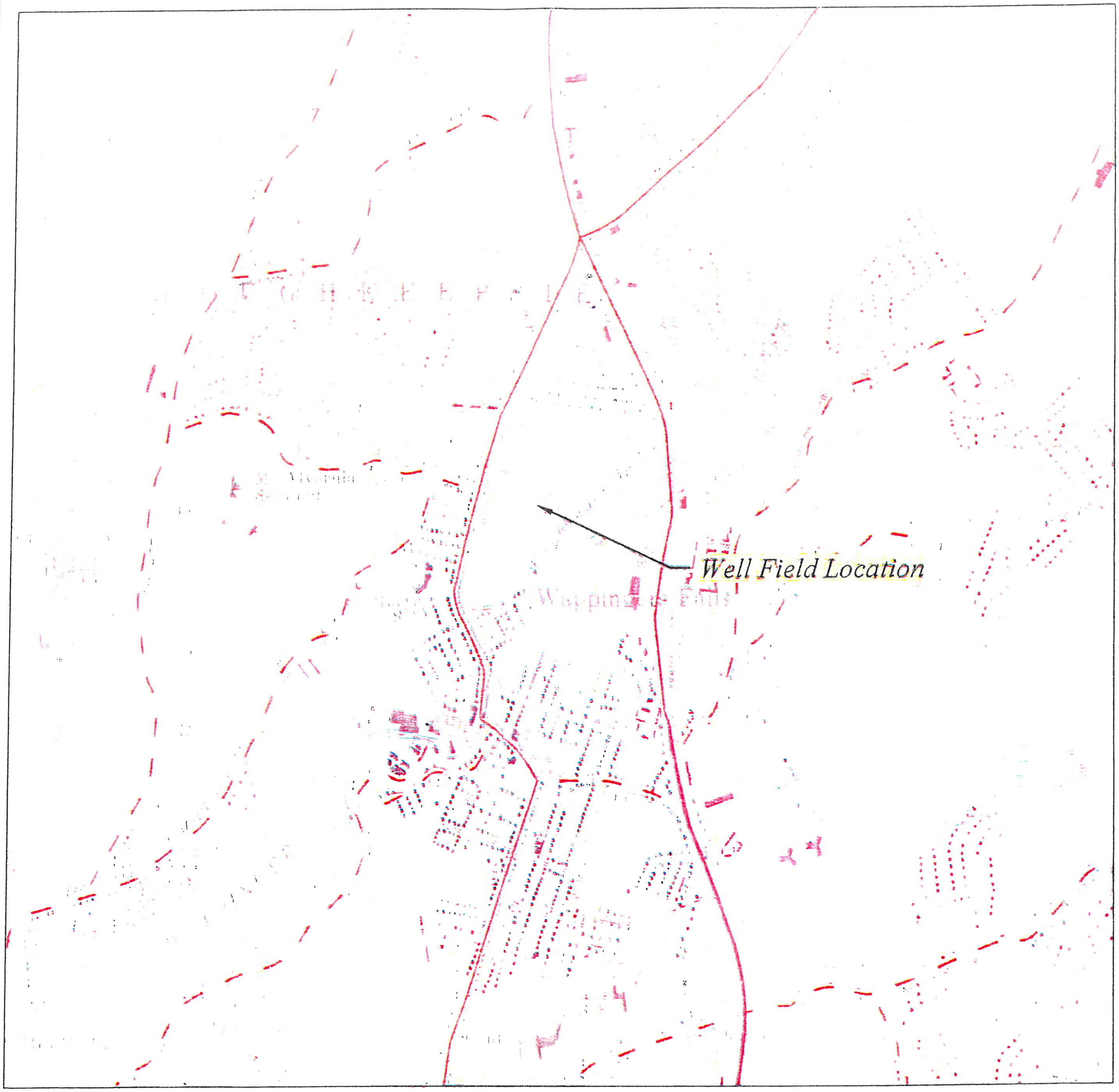
Leggette, Brashears & Graham, Inc., January 2004, report entitled, "Well No. 3 Pumping Test Report, Village of Wappinger Falls, New York".

Leggette, Brashears & Graham, Inc., June 2005, letter report addressed to Charles Del Bene, Jr., "Test Borings Results, Village of Wappinger Falls Well Field", Trumbull, CT.

Todd, David Keith, "Groundwater Hydrology", John Wiley & Sons, Inc., New York, 1980.

FIGURES



SOURCE: USGS TOPOGRAPHIC QUADRANGLE WAPPINGERS FALLS, NEW YORK (PHOTOREVISED 1981).

N

QUADRANGLE LOCATION

0 2000

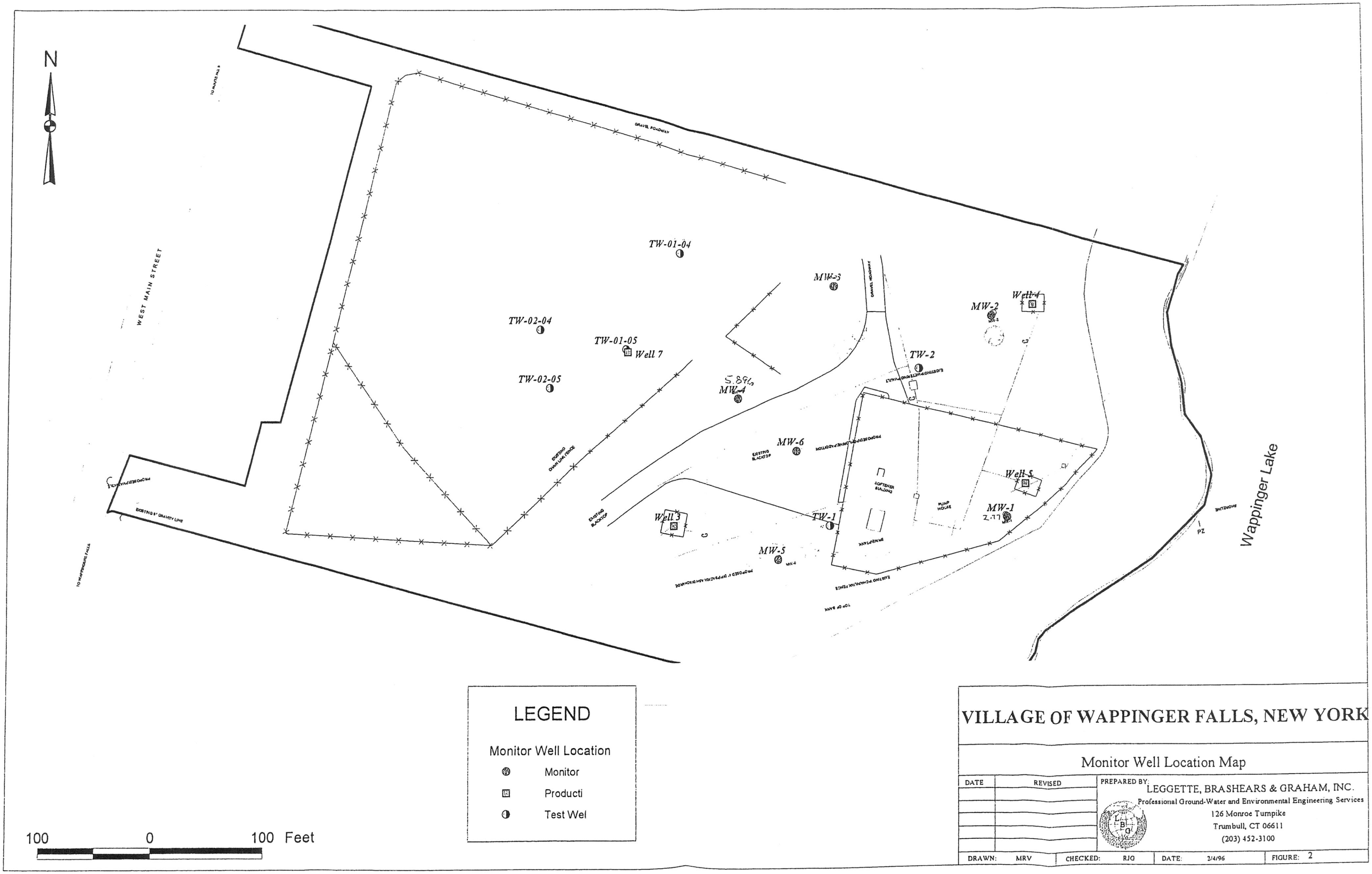
SCALE IN FEET

VILLAGE OF WAPPINGERS FALLS, NEW YORK

SITE LOCATION MAP

DATE	REVISED	PREPARED BY:
		LEGGETTE, BRASHEARS & GRAHAM, INC. Professional Ground-Water and Environmental Engineering Services 126 Monroe Turnpike Trumbull, CT 06611 (203) 452-3100

DRAWN:	MRV	CHECKED:	MD	DATE:	7/7/03	FIGURE:	1

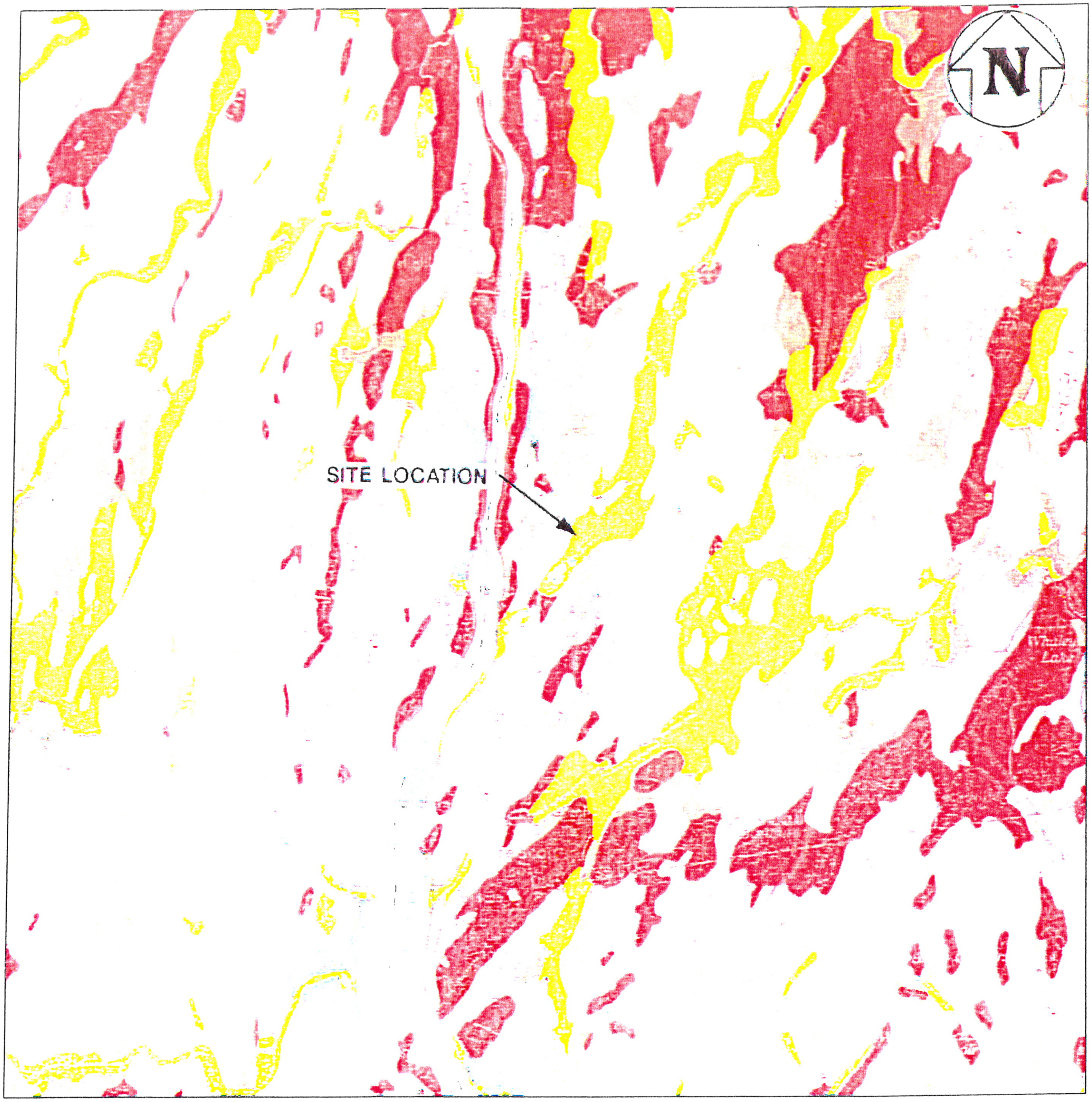


VILLAGE OF WAPPINGER FALLS, NEW YORK

Monitor Well Location Map

DATE	REVISED	PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC. Professional Ground-Water and Environmental Engineering Services 126 Monroe Turnpike Trumbull, CT 06611 (203) 452-3100

DRAWN: MRV | CHECKED: RJO | DATE: 2/4/96 | FIGURE: 2



SOURCE: SURFICIAL GEOLOGIC MAP OF NEW YORK, 1989.

LEGEND

STRATIFIED DRIFT

TILL

0 5

SCALE IN MILES

VILLAGE OF WAPPINGERS FALLS, NEW YORK

SURFICIAL GEOLOGY MAP

DATE	REVISED

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
126 Monroe Turnpike
Trumbull, CT 06611
(203) 452-3100

DRAWN:	FCS	CHECKED:	KT	DATE:	11/04/03	FIGURE:	3

J:\DWG\WFDWS\F5.dwg, Layout1, 10/4/2006 1:42:51 PM, Drafting.pc3

VILLAGE OF WAPPINGERS FALLS, NEW YORK

Drawdown versus Distance Plot From Aquifer Test
on Production Well 7 From September 13 to 16, 2005

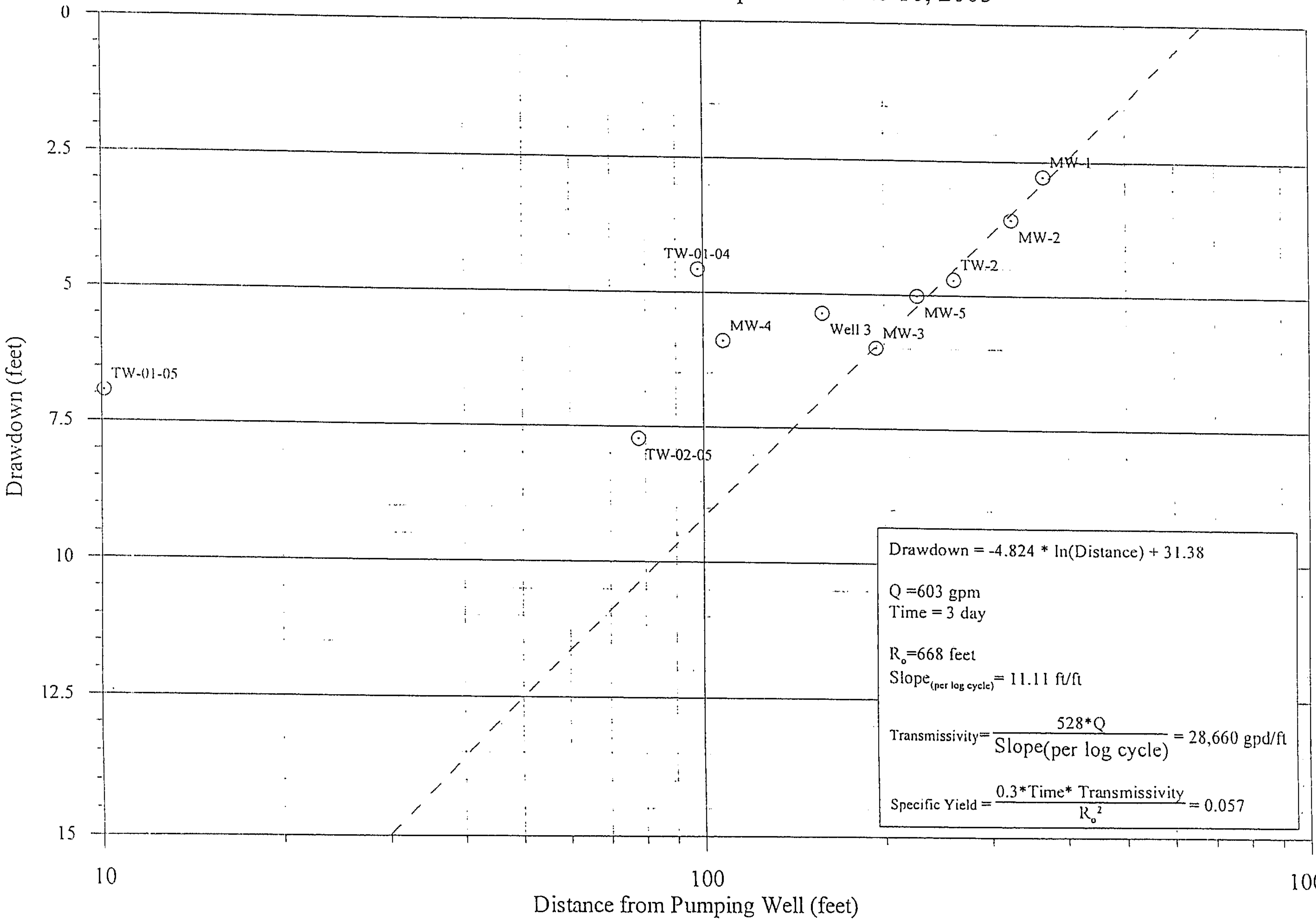


Figure 6

H:\spreadsheet\wappingers falls\wappingers92005\dd correction

LEGGETTE. BRASHEARS & GRAHAM. INC

<u>APPENDIX "C"</u>

- **CORRESPONDENCE FROM THE DUTCHESS COUNTY DEPARTMENT OF HEALTH**

- **CERTIFICATE OF ANALYSIS FOR MPA TESTING OF WELL 3 DATED 07/13/2005**

Dutchess

Dutchess
County
Department
of Health

illiam R. Steinhaus
County Executive

ichael C. Caldwell,
MD, MPH
Commissioner

ironmental Health

387 Main Street
Poughkeepsie
New York
12601
(845)486-3404
Fax (845)486-3545

December 22, 2006

Mayor Calvin Lawrence
Village of Wappingers Falls
2628 South Ave.
Wappingers Falls, NY 12590

Village of Wappinger Falls PWS
Town of Wappinger
Fed ID # 1302783

Dear Mr. Lawrence:

Part 5 of the New York Sanitary Code addresses your responsibility relative to ownership, operation and monitoring the above referenced facility. With Part 5 as basis, I conducted this department's regular inspection/ sanitary survey of your water supply. The inspection took place on December 11,2006. Accompanying me and providing input was your Part 5-4 New York State Department of Health certified water operator, Donald Booth. Through the course of the inspection, I observed that your water system is very well operated and adequately maintained. The treatment of well 3 takes place via softening, iron removal and chlorination. Other major components include three distribution system storage tanks and a 6" connection to the town of Poughkeepsie distribution system allowing potable water consumption via the town's sources. At the time of inspection, well 3 was off line and all water consumption was via the town of Poughkeepsie connection. A chloramine disinfection maintenance residual of 2.5 parts per million was observed at the well field area from the town supply. This past year's average daily flow as calculated from water treatment system operation reports was approximately 530,000 gallons per day. This figure is lower than past years. The following items were noted and discussed at the time of inspection and are reiterated below as recommendations or documentation for the New York State Department of Health Bureau of Public Water Supply Protection Program:

1. Part 5-1.72 addresses monthly operation reports. It is observed that your facility's reports were submitted in a timely manner with the appropriate information provided.

2. It is recommended that all distribution system storage tanks be equipped with high level/ low-level alarms. Future planning should incorporate the possibility of a storage tank elevation monitoring system capable of controlling the well/treatment plant cycling. The current operational mode of manual control is not efficient and is outdated. Possible distribution system tank improvement should also include a means of tank cycling to insure adequate water volume turnover. The very old Hillside tank should be inspected and equipped with a proper overflow pipe directed to grade away from the structure. It was observed that this tank is in need of paint and that the tank access ladder appeared broken and unsafe.

http://www.dutchessny.gov

3. Part 5-4 of the New York State sanitary code directs that you employ a minimum grade 2B certified operator and a minimum grade C assistant certified operator. It is also required that your facility employ a grade D distribution system certified operator. Please be sure that appropriate qualifications are maintained.

4. Be reminded that Part 5-1.72(e) directs the delivery of a copy of your facility's water quality report to all consumers by no later than May 31, 2007.

5. Part 5-1.52 table 9A requires total trihalomethane and halocetic acid distribution system monitoring. Please continue with the recent past monitoring regimen and consult with your operator relative to a possible future EPA directed sampling site increase. Data available to the Health Department indicates that your maximum distribution system residence time quarterly annual running average for halocedic acid is .0317 mg per liter and for total trihalomethanes is .0508 mg per liter, both below maximum contaminant levels.
6. Part 5-1.31 addresses cross connection control relative to protection of water quality via assured containment of possible contaminants within a consumer's plumbing. This section of code directs a program of inventory, degree of hazard assessment, and device installation with annual testing. This office receives some sporadic device testing data for your system. Annual testing of all devices with submission to this office is required. Past program deficiencies have been documented by this department and enforcement action required. A program incorporating all commercial and industrial type connections with degree of hazard assessment, device installation need or testing need assessment has been agreed to. Please provide the appropriate response by June 30, 2007. The water plant's backwash waste water line is piped directly into the village sewage collection main, an air gap or reduced pressure zone device seems appropriate, and evaluation must be made. It is recommended that the village water operators be trained as cross connection control technicians and testers.
7. The purchased town of Poughkeepsie water normally contains fluoride and orthophosphate. It is recommended that the water district monitor at least 2 distribution system sites per year to determine fluoride concentration/ consumption. Quarterly phosphate concentration monitoring toward distribution system corrosion protection is also required.
8. Well field protection must be enhanced to abate possible contamination. During the inspection, I observed a gas station and parking lot in close proximity to the well field where many old vehicles are stored. There is also a nearby graveyard. Dumping anything in the well area, even snow, should not be allowed. Possible impacts could not be known until zones of influence tributary to the well field are identified. Contamination detects have already been documented at the well field. A well head protection ordinance, inspection and ground water monitoring program should be implemented for pollution prevention. I strongly recommend additional fencing and road gating at the entrance to the well field. An employee bathroom and washroom at the treatment plant is highly recommended for sanitation purposes. An emergency automatic generator should be budgeted for installation at the well field as soon as possible.

9. Part 5-1.40 addresses control of lead and copper in drinking water. Due to the recent change in disinfection chemical, distribution optimal corrosion control must be redocumented. Two consecutive 6-month monitoring periods of first draw lead and copper samples shall be collected at 40 sites. The first sampling period shall commence on January 1, 2007 with result submission by July 10, 2007.

10. The Safe Water Drinking Act incorporates the concept of ground water under the direct influence of surface water. Given the proximity of the well field to the nearby Wappinger Lake, influence is likely. Hydrogeologic evaluation has implicated well 5 as being impacted. Even though iron filtration is provided for well 3, monitoring has been conducted for years to insure quality relative to surface water impact protection. Please continue the well 3 monitoring for microscopic particle analysis, cryptosporodium, and giardia when the well is in use and as necessary to provide data for the ongoing engineered influence evaluation.

11. To assist in confirmation of treatment capability, quarterly Part 5-1.52, table 8B inorganic chemical monitoring has been required. Please continue this worthy program when the treatment plan is on line.

12. Be reminded that entry point nitrate and inorganic chemical group 1 monitoring (Part 5-1.52, tables 8D and 8C respectively) must be conducted by the end of this year should the treatment plant be activated.

13. Part 5-1.52 table 9B and 9D address principal organic contaminant/MTBE monitoring. Detects for MTBE and methlene chloride have been observed at your well field. A detection is not a maximum contaminant level violation as detects are typically far below this concentration. Detects do warrant quarterly monitoring. Be advised that based upon Part 5, quarterly monitoring of the raw well water from well 3 must be conducted for both principal organic contaminants and MTBE whenever well 3 is on line.

14. Part 5-1.52 table 9C addresses specified organic contaminants, groups 1 and 2 (pesticides/herbicides/etc.) monitoring. This section directs monitoring every 18 months for your facility. Be reminded of the need to submit the noted data by June 30, 2007 from a well 3 sample if on line.

15. It is recommended that the Village pursue possible emergency inner connections with the town of Wappinger CWWIA or North Wappinger Water Systems as well as an additional inner connection with the town of Poughkeepsie.

16. At the time of the inspection I collected samples for a variety of possible contaminants to be analyzed by the Dutchess County Department of Health laboratory. Results will be forwarded to your operator when available.

17. Be reminded of the dangers of confined spaces, as many exist in the old water system. Training for protection regarding air quality, electrical shorts and possible pipe bursts is appropriate. System planning should involve the removal of pits or removal of pit access need for such things as sampling, meter reading and valve adjustment.

18. Village growth will stress current water supply capability. Be reminded of a commitment for additional water based on recent Health Department approvals for distribution system expansion. Please provide the agreed to water needs resolution proposal to this department by March 31, 2007.

Enclosed for your use is a sampling status sheet. It gives historical quality data and indicates future monitoring needs. Be reminded that quality monitoring is entirely the water districts responsibility as directed in Part 5. Should you have questions regarding the above information or desire health department assistance, please contact the writer at 486-3404.

Very truly yours,

Peter J. Marlow

Peter J. Marlow, P.E.
Senior Public Health Engineer
Environmental Health Services

Encl.

PJM: tb

cc: Donald Booth, Certified Operator (w/encl)
Anna Stamm – NYSDOH
Joe Tagliavia (w/encl)
Robert Travis – Village of Wappingers Falls Water Board (w/encl)
File

Dutchess

Dutchess
County
Department
of Health

William R. Steinhaus
County Executive

Michael C. Caldwell,
MD, MPH
Commissioner

Environmental Health

387 Main Street
Poughkeepsie
New York
12601
(845) 486-3404
Fax (845) 486-3545

May 23, 2006

Mayor Calvin Lawrence
Village of Wappingers Falls
2628 South Avenue
Wappingers Falls, NY 12590

Re: Village of Wappingers Falls PWS
Fed ID # 1302783

Dear Mr. Lawrence:

In conformance with this department's public water supply surveillance program for the NYS DOH, I conducted a file review of code compliance issues regarding your above facility. Said review revealed outstanding concerns that must be resolved as follows:

1. Production: This department's last inspection letter addressed lack of source production as your system's most important problem. I am aware of a submission to the state health department an approval for connection of new Well 7. Even with the expected large flow of future Well 7, additional sources or connections are likely still necessary to enable compliance with conservative production design parameters using safe yield analysis and considering future development. A report of village water needs incorporating an evaluation of possible additional sources and their treatment requirements shall be submitted to this office by September 1, 2006. Said reports should also provide a preliminary time frame for production improvement goals.

2. Cross Connection Control: Two previous inspection letters by this office observed village compliance short comings in this area. A report incorporating device inventory, degree of hazard assessment and program needs must be submitted. Nothing has been received. By September 1, 2006, a program narrative for cross contamination prevention including implementation dates shall be submitted to this office.

3. Ground water under the direct influence of surface water: Recent Well 3 quality data documented insect and crustacean parts as well as rotifers and pollen, possibly from the nearby Wappingers Lake. The implication is that hard to treat large pathogens from surface water could impact potable quality. This data dictates that an evaluation be conducted. This department's communication of October 26, 2005 directed that evaluation. The requested submission was not received. Please provide compliance by no later than September 1, 2006.

4 Chloramination: The city and town of Poughkeepsie have New York State Department of Health approval for a directional flushing program to be followed by an approved switch over to the noted disinfection chemical. Possible ramifications on village Well 3's current disinfection system towards impact on distribution system quality and residual maintenance must be addressed. A possible disinfection system modification or distribution system monitoring program must be designed, approved and implemented for the future chloramine change over. Please provide a report regarding village intention on this matter by September 1, 2006.

Thank you in advance for your cooperation on the above matters, please provide the requested reports/information if available prior to the noted date. Please contact the writer at 486-3404 relative to questions or assistance on the above matters.

Very truly yours,

Peter J. Marlow

Peter J. Marlow, P.E.
Senior Public Health Engineer
Environmental Health Services

PJM: tb

cc: Anna Stamm, P.E. – NYSDOH
Donald Booth, Certified Operator
J. Paggi, P.E.
Bill Gilday, P.E. – NYSDOH, Troy
File

Dutchess

Dutchess County Department of Health

William R. Steinhaus
County Executive

Michael C. Caldwell, MD, MPH
Commissioner

Environmental Health

387 Main Street
Poughkeepsie
New York
12601
(845) 486-3404
Fax (845) 486-3545

OCT 27 2005

October 25, 2005

Victor L. Moruzzi, County Chairman, Water Commissioners
Water Department-Village of Wappingers Falls
Mesier Park Homestead
Wappingers Falls, NY 12590

Re: Village of Wappingers Falls PWS
Fed. I.D. No.: 1302783
Town of Wappinger

Dear Mr. Moruzzi:

This communication is to address village public water supply compliance needs regarding part 5-1.30 of the New York State Sanitary Code. The noted section directs filtration for ground water sources under the direct influence of surface water. With 5-1.30 as a basis, I directed continued microscopic particle analysis monitoring for your facility's source water via my last inspection letter. The resulting data submitted to this office from June 30, 2005 and September 14, 2005 sample collections indicate insect and crustacean parts as well as rotifers and pollen in well 3 water. Based on these quality results, you are directed to hire the services of a New York State licensed engineer. Said engineer will evaluate historical hydrogeologic and source data and propose a water quality assessment program to this department. The goal of the program will be to enable ground water under the direct influence of surface water determination. Be advised that your engineer must provide the outline of this program for review purposes by no later than November 30, 2005. You are also directed to continue microscopic particle analysis monitoring including giardia and cryptosporidium until the determination is made or filtration provided.

Should you have any questions regarding this issue or if I can be of assistance please contact me at 486-3404.

Very truly yours,

Peter J. Marlow

Peter J. Marlow, P.E.
Senior Public Health Engineer
Environmental Health Services

PJM: tb

cc: Mayor Calvin Lawrence
Donald Booth, Certified Operator
file (097-18726)

FRIEND LABORATORY INC

32 ITHACA STREET WAVERLY, NY 14892-1532
TELEPHONE (607) 565-3500 FAX (607) 565-4083
NY 10252 NJ 73168
PA 68180 EPA NY00033

Certificate of Analysis

Smith Laboratory
4 Scenic Drive
Hyde Park, NY 1248
Attn: Anne Smith

Subject:
MPA

Order Number: 0507-00090
Date Reported: 7/13/2005
Date Received: 7/1/2005
Invoice Number: 18883
Customer Number: S051
Customer PO:
Certification Date: 7/13/2005

SMP	Analysis Performed	Result	Units	Detection Limit	Method	Analysis Information
001	68999 Well 3 6/30/2005 0:00 Client					
	MPA					7/1/05, 13:00, EMR
	Cryptosporidium	U	/100 L	0.2	ICR USEPA	7/1/05, 13:00, EMR
	Giardia	U	/100 L	0.2	ICR USEPA	7/1/05, 13:00, EMR
	Algae	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Diatoms	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Rotifers	5.6E + 01	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Rotifer Eggs	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Plant Matter	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Pollen	2.0E + 02	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Insects	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Insect Parts	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Nematodes	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Nematode Eggs	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Crustaceans	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Crustacean Parts	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Protozoa	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Fine Debris	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Large Debris	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Particle Size of 5-15 uM	2.7E + 06	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Particle Size of 15-100 uM	1.2E + 05	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Particle Size of 100-200 uM	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Particle Size of >200 uM	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
002	69000-Lake 6/30/2005 0:00 Client					
	MPA					7/1/05, 13:00, EMR
	Cryptosporidium	91	/100 L		ICR USEPA	7/1/05, 13:00, EMR
	Giardia	360	/100 L		ICR USEPA	7/1/05, 13:00, EMR
	Algae	1.4E + 07	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Diatoms	1.6E + 08	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Rotifers	1.8E + 04	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Rotifer Eggs	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Plant Matter	7.8E + 03	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Pollen	1.3E + 04	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Insects	2.6E + 03	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Insect Parts	2.6E + 03	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Nematodes	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Nematode Eggs	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Crustaceans	2.6E + 03	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Crustacean Parts	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR

Key: E = estimated value
ND or U = analyte not detected
B = analyte was detected in the method or trip blank
< = less than the indicated value
ug/L = micrograms per liter (equivalent to parts per billion)
mg/L = milligrams per liter (equivalent to parts per million)
mg/Kg = milligrams per kilogram (equivalent to parts per million)

32 ITHACA STREET
TELEPHONE (607) 565-3500
WAVERLY, NY 14892-1582
FAX (607) 565-4086
NY 10252 NJ 73168
PA 68180 EPA NY00032

Certificate of Analysis

Smith Laboratory
4 Scenic Drive
Hyde Park, NY 1243
Attn: Anne Smith

Order Number:	0507-00090
Date Reported:	7/13/2005
Date Received:	7/1/2005
Invoice Number:	18883
Customer Number:	S051
Customer PO:	
Certification Date:	7/13/2005

Subject:
MPA

SMP	Analysis Performed	Result	Units	Detection Limit	Method	Analysis Information
002	69000-Lake 6/30/2005 0:00 Client					
	continued					
	Protozoa	2.6E + 03	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Fine Debris	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Large Debris	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Particle Size of 5-15 uM	1.8E + 08	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Particle Size of 15-100 uM	1.4E + 08	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Particle Size of 100-200 uM	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR
	Particle Size of >200 uM	ND	/100 L		EPA 910/9-92-029	7/1/05, 13:00, EMR

Approved By: ______
Jason Henrigheus, Managing Director

Key: E = estimated value
ND or U = analyte not detected
B = analyte was detected in the method or trip blank
< = less than the indicated value
ug/L = micrograms per liter (equivalent to parts per billion)
mg/L = milligrams per liter (equivalent to parts per million)
mg/Kg = milligrams per kilogram (equivalent to parts per million)